MINING WORLD

in this issue

West Hill: Newest Mesabi Mill

Page 46

EIMCO

PRODUCTION LOADING underground reaches a new low cost when Eimcos are used. In production, no single piece of equipment is as necessary as a good dependable Eimco loader. Write for "Drawpoint Loading with Eimcos."

THE EIMCO CORPORATION
Salt Lake City, Utah, U.S.A.
Export Office: Eimco Bldg., 52 South St., New York City

MARCH, 1954

Vol. 16 No. 3

35 cents a copy
in sterling 3s

Keep your buckets moving with TIREX

Notice the line between the bucket and boom base? That's electric trailing cable furnishing power to the shovel. Whatever happens to it to stop current flow stops the shovel, idles workmen, costs money.

Spilling ore beats on the cable. The truck behind the upper end of the dipper sticks runs over it sometimes. High temperature of the sun-heated pit and current load fry it. It gets abraded, strained, soaked in water, and covered with oil. That's why it should be the best cable that money can buy.

Simplex-TIREX High Voltage Portable Cable has the toughest, most abrasion-resistant jacket known. It is designed and engineered especially for mining requirements. It is the only trailing cable made with the famous Selenium Neoprene Armor and is cured in lead. Used to transmit power to shovels, dredges, cranes, and draglines, it is resistant to moisture, acids, alkalies, oil, flame, and sunlight.

If you're not now using Simplex-TIREX Trailing Cable, write for Catalog 1012 to the address below, or contact your nearest Simplex representative.

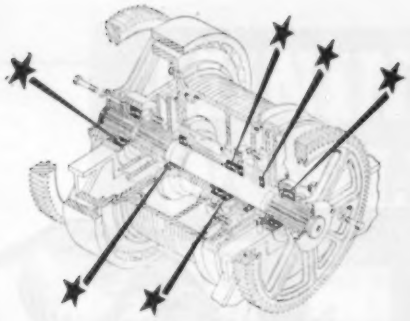
Simplex WIRES & CABLES

TIREX CORDS AND CABLES *are made only by the*

SIMPLEX WIRE & CABLE CO., 79 Sidney St., Cambridge 39, Mass.

LIMA'S

shafts and drums roll on anti-friction bearings



STARS INDICATE LOCATION OF ANTI-FRICTION BEARINGS IN DRUMS AND PILLOW BLOCKS

As a result of twenty-five years' experience with anti-friction bearings, Lima design engineers know exactly where to put them to give you maximum benefits. This cut away view shows how Lima utilizes anti-friction bearings in the drums. X-ray vision would show you how Lima uses them throughout the main machinery on all shafts and other important parts.

This modern means of eliminating destructive friction benefits LIMA owners through faster operating speeds and lower upkeep. Anti-friction bearings also maintain perfect shaft alignment and insures smoother, easier clutch action.

LIMA Type 2400 Shovel, equipped with 36' boom, 27' dipper handle, 6 cu. yd. dipper.

COMPARE! No other machine gives you as much as LIMA!

1. Bronze bushings in tread, idler and drive rollers are protected by piston-type dirt seal rings and retainers.
2. All gears, smaller parts and shafts which are subject to extra wear are flame or induction hardened for longer life.
3. Main machinery is placed well back of center of rotation to eliminate excess counterweight.
4. Anti-friction bearings, used at all important bearing points, reduce destructive friction, fuel consumption and lubrication requirements.
5. Big capacity drums and sheaves lengthen cable life by reducing the need for double wrapping and sharp bends in cable.
6. Full air controls on travel, hoist, swing and boom hoist, result in smoother, more precise operation, minimum maintenance and less operator fatigue.
7. Torque converter (optional) automatically adjusts speed to load requirements, minimizing shock loading, making performance smoother and faster.
8. Wherever you are, you can depend on skilled service and nearby warehouse stocks of parts to keep your LIMA on the job continuously.

COMPARE and you'll specify LIMA for shovels (¾ yd. to 6 yds.), cranes (to 110 tons) and draglines (variable). Smaller capacities available on rubber.

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LIMA

SHOVELS • CRANES
DRAGLINES • PULLSHOVELS

BALDWIN-LIMA-HAMILTON CORPORATION
Construction Equipment Division
LIMA, OHIO, U.S.A.

"AARDVARK,"

First Word in Webster...

(S. Afr. D., earth pig.) A large burrowing nocturnal African mammal with extensile tongue, powerful claws, large ears and heavy tail that feeds largely on termites.

Last Word in TRUCKS!

Dart's "Aardvark" shuttle truck, just 66 in. high operates equally well "going or coming." Driver's seat swivels to dual controls. Its 18 Ton load is unloaded in a matter of seconds by an hydraulically actuated, apron-type conveyor. 275 H. P. Diesel is exhausted through a scrubber.

Dart's 18-s-ug-s

DART

With many "Firsts" to the company's credit, DART'S new Aardvark is a noteworthy addition to the list—first Diesel powered underground shuttle truck.

Time-tested and operation-proved, the new DART offers mine operators a great potential in increased tonnages—and lower haulage costs.

If your operation requires the movement of material underground, it will pay you to write for performance data, complete specifications on the new "Aardvark."

DART TRUCKS
Kansas City 8 Missouri
SUBSIDIARY OF THE CARLISLE CORPORATION

MINING WORLD

Including the Export Edition **WORLD MINING**

Published monthly except in April when publication is semi-monthly

VOLUME 16 **MARCH 1954** **NUMBER 3**

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THE COVER CIRCLE: Wemco 8- by 8- foot drum separator at Western Mining Company's West Hill, Minnesota iron beneficiation plant. The conveyor belt carries plus-⅛-inch washed feed to the drum.

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Puts fresh air where you want it—*Anywhere*

Mine-Vent Tubing is made to go anywhere that fresh air is needed . . . with fittings available for every conceivable coursing dip, curve or bend. Yet, Mine-Vent is easy to move: Patented snap-on couplings and simplified hangers will save you countless hours of installation time. One man can hang 100 feet of Mine-Vent an hour with ease. with flexing.

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Durable, easy-to-handle fiber drums keeps MineVent in perfect condition until you need it

MineVent Tubing

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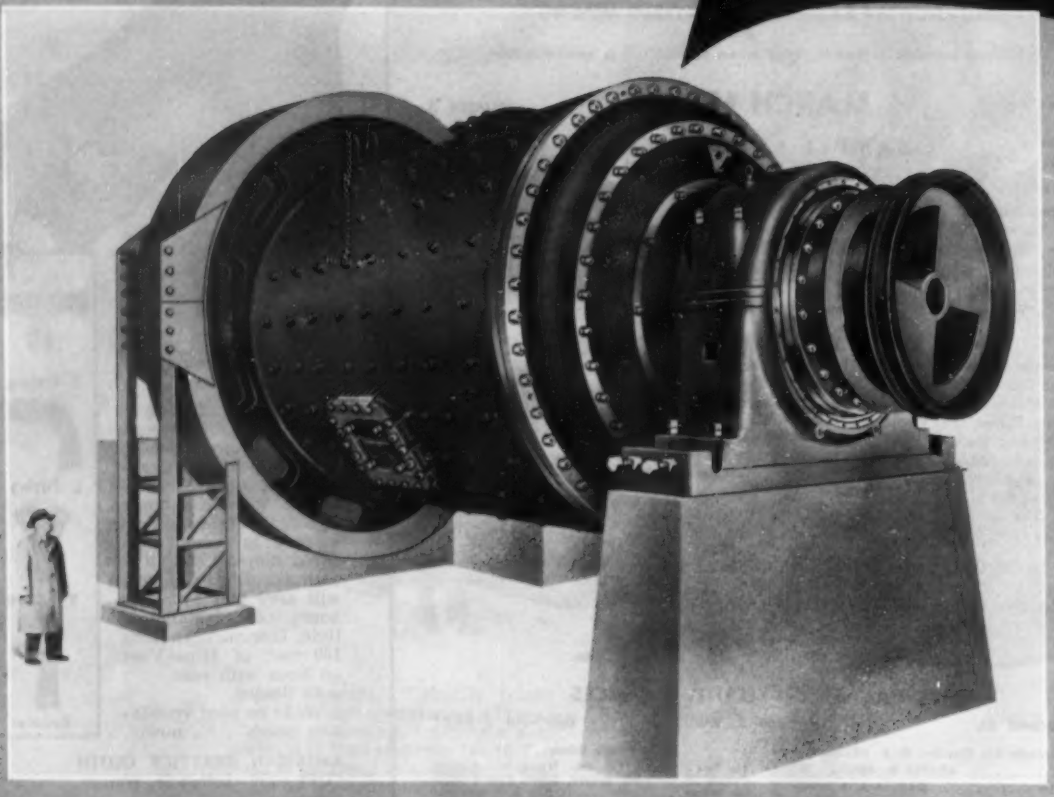
largest ore-grinding mills ever built



Marcy 12'-6" I.D. x 13' Grate Discharge Ball Mills

Here's a typical example of M&S specialized grinding engineering service...designing and manufacturing new, larger mills which would give the desired tonnage with lower capital investment in equipment and buildings, compared with sizes previously available.

Each of the six 12'6" Marcys ordered by this Michigan copper company is powered by a 1500 hp motor; weighs 369,000 lbs.; has all the proved advantages of the MARCY* low-pulp-line, grate discharge principle of grinding.

*Both Marcy and Maasco are registered trademarks.

The Mine & Smelter Supply Co.

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OFFICES IN SALT LAKE CITY, EL PASO, 1775 BROADWAY, N. Y. C.

REPRESENTATIVES IN FOREIGN COUNTRIES

High Production and Lower Maintenance–

You Get BOTH with "Eucs"

Built for tough off-the-highway service, Rear-Dump Euclids have increased production and reduced hauling costs on scores of open pit mining and quarry operations. Ability to deliver "plus" performance year in and year out has made "Eucs" the accepted standard for comparison . . . here are some of the reasons why:

RUGGED SIMPLICITY

Designed and built for long life and low maintenance cost. All of Euclid's experience and facilities are devoted to specialized off-the-highway earth moving equipment.

CAPACITY

Euclids have payload capacities of 10, 15, 22, 34 and 50 tons. Because they are matched to various sizes of loading and crushing equipment, "Eucs" provide a well balanced operation for open pit haulage and increase the efficiency of the loading unit.

POWER AND SPEED

Powered by diesel engines of 125 to 600 h.p. "Eucs" have top speeds with full payload, up to 36 m.p.h. Five and ten speed transmission, or torque converter with semi-automatic transmission available. The favorable ratio of horsepower to payload means more pay tons hauled every trip.

VERSATILITY

"Eucs" are efficient for moving any material on any length of haul; handle overburden, rock, coal, ore and other materials loaded by shovels, draglines, transfer hoppers and mobile loading equipment.

If you are interested in higher production at lower cost, have your nearby Euclid Distributor show you what "Eucs" are doing on work similar to yours. He'll be glad to make a hauling cost estimate for your job—no obligation, of course.

EUCLID DIVISION
GENERAL MOTORS CORPORATION
Cleveland 17, Ohio

Cable Yuklid—Code Bentley

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

GM GENERAL MOTORS

ENGINEERING SIDELIGHTS OF SHASTA DAM:

The clean, simple lines of this concrete gravity dam, towering 602 feet above the bed rock of the Sacramento River Canyon, give no hint of the mammouth engineering feats that had to be accomplished before the dam was constructed. Prior to erection of Shasta, builders had to relocate 37 miles of mainline railroad, 21 miles of main highway . . . drive 12 new railroad tunnels through the mountains and erect 8 bridges. Next they installed a complex system of overhead cableways that covered the entire dam and power plant areas. Suspended from these cables were 8-cubic-yard buckets used to carry concrete to far-flung job sites. Following this overwhelming preconstruction activity, erection of the dam itself seemed relatively easy even though enough concrete was poured to lay a three-foot walkway completely around the world at the equator. In this instance, pre-planning was largely responsible for the successful construction of the project.

A Traylor TC Gyratory Represents Half-A-Century of Engineering Planning to Solve Your Production Problems

In countless countries around the world you'll find producers depending on Traylor's curved crushing surfaces and non-chokable bell head features to assure steady output and boost production records. That's because the curved crushing surfaces in a Traylor TC Gyratory apply power as a direct crushing force to reduce lifting and churning . . . packing and choking. These are only two of many Traylor Engineering achievements which help you produce a more uniform cubical aggregate at less cost. Free Bulletin 7112 gives a complete outline and description of all Traylor features. Send for your free copy today.

Built in seven sizes with feed openings from 20" x 80" to 60" x 210".

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Primary Gyratory Crushers | Rotary Kilns | Secondary Gyratory Crushers | Ball Mills | Jaw Crushers | Apron Feeders

You can get latest Hard-Facing know-how in *either* language!

The Stoody HARD-FACING GUIDE-BOOK is a recognized manual covering hard-facing procedures for heavy equipment. A complete chapter is devoted to the best methods of prolonging life of mining machinery.

To best serve our next door and overseas neighbors, this helpful manual is now published in Spanish as well as English. The profuse illustrations simplify all hard-facing techniques, enabling you to get more service from your equipment. Write for your copy today!

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Please send without cost ☐ copies of the STOODY GUIDEBOOK. ☐ Spanish Edition ☐ English Edition.

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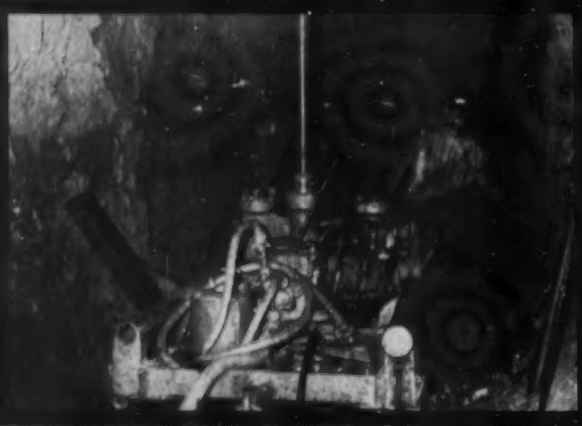
AMERICAN ZINC PICKS

A Joy Jib Jumbo, as used for all track-type drifting, permits a two-man crew to drill an average of 154 feet per shift, using only 45% of their time on the drilling operation. Jib Jumbos mount two T-300 drifters on eight-foot chain feeds. Hydro Drill Jibs make drill positioning fast and easy.



A Joy Drillmobile, with a two man crew, drills an average of 220 to 240 feet per eight-hour shift. Drillmobiles now in use mount two Joy T-300 (3-inch) Drifters on ten-foot chain feeds, all on hydraulically-actuated Joy Hydro Drill Jibs. All drilling in trackless mining sections is done with Drillmobiles.

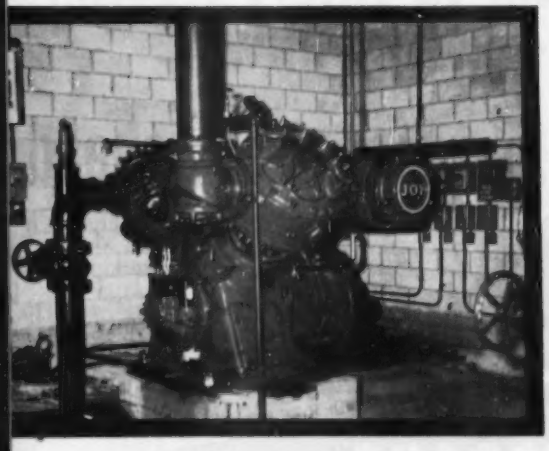
Air for mine ventilation is furnished by Joy Axivane Blowers, installed in the ventilation line as illustrated here. Additional Axivane Blowers are added in the line as necessary.

JOY EQUIPMENT

for

Joy CF-211 Slusher Hoist scraping ore into a glory hole in one of the large stopes of a Mascot mine.

EFFICIENT MINING AT NORTH FRIENDS STATION



For a dependable compressed air supply for this efficient mining operation, they selected Joy WN-112 two-stage, double-acting, heavy-duty compressors. The unit pictured here is the one most recently installed.

American Zinc Company of Tennessee, whose operations in Knox and Jefferson Counties have been described as among the country's most efficient, chose Joy equipment to help attain that efficiency at their North Friends Station Mine. Overall output has been boosted to 30 tons per man shift—including supervision—and production has been increased such that it compares favorably with some large open pit mines.

The help which American Zinc has gotten from the use of Joy equipment could also apply to your mining operation. Look at these examples of the use of Joy machines . . . then check on how they could help you.

Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.
In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

WBD MASSS

ROCK RATED!

for the hardest years ahead

Your profits depend on the strength and speed of loading equipment — and P&H gives you more of *both*.

P&H *greater strength* comes from welded alloy steels — the toughest construction known. No wonder P&H can take pounding and shock loads that K.O. less rugged machines.

P&H *greater speed* comes from Magnetorque* Electric Swing — actually 15% to 25% faster than any other machine of its size to give you greater production, lower tonnage costs. And it's goodbye to maintenance and replacement problems for years to come . . . Magnetorque lasts the life of your P&H.

But to get fully acquainted with this outstanding producer, let us direct you to a 955-A in action. If you want bigger capacity, same advanced design, ask about the P&H 1055-A (3½ yd.)

P&H

MAGNETORQUE

Electric Swing puts you beyond the "clutches of wear"

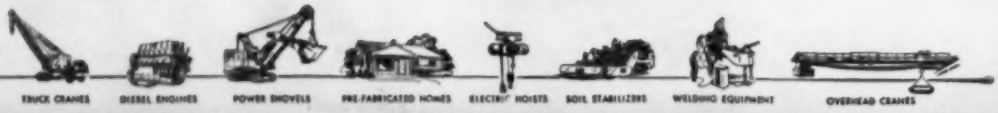
P&H LARGE EXCAVATOR DIVISION

HARNISCHFEGER CORPORATION

• MILWAUKEE 46, WISCONSIN

*T.M. of Harnischfeger Corporation for electro-magnetic type coupling.

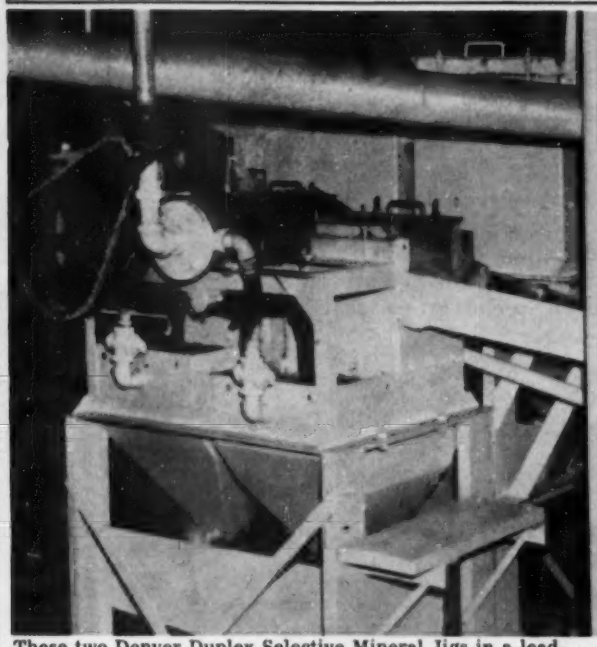
the P&H *Line*



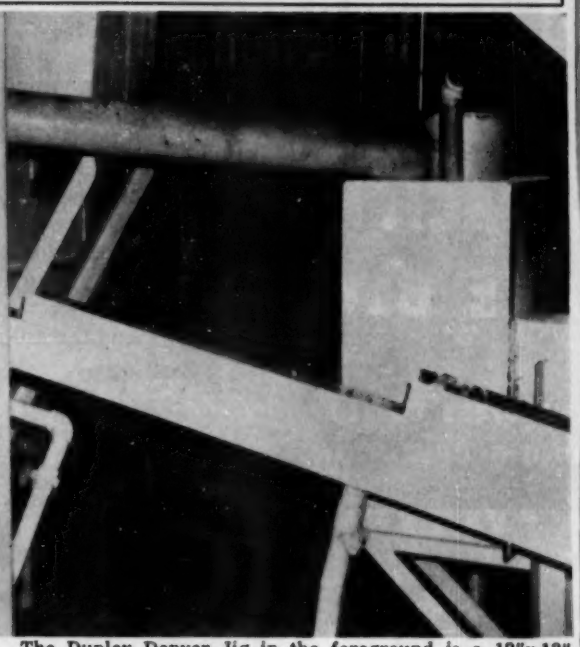
TRUCK CRANES · DIESEL ENGINES · POWER SHOVELS · PRE-FABRICATED HOMES · ELECTRIC HOISTS · SOIL STABILIZERS · WELDING EQUIPMENT · OVERHEAD CRANES

DENVER SELECTIVE MINERAL JIGS

Complete Milling Equipment—from testing, to feeder, to dryer!



These two Denver Duplex Selective Mineral Jigs in a lead-fluorspar mill recovered one carload of lead sulphide concentrate in nine days' operation, assaying 80-81% lead.



The Duplex Denver Jig in the foreground is a 12"x 18" model, the Duplex Denver Jig in the background is a 16"x 24" model.

Increase Profits By Increasing Overall Mill Recovery With A Denver Selective Mineral Jig

Many minerals whose gravity is higher than their gangue are easily and profitably recovered with the Denver Selective Mineral Jig. This Denver Jig is designed especially to treat unscreened, unclassified feeds such as in a ball mill-classifier circuit, and to recover the mineral as soon as it is free — in the coarsest possible fraction. Recovering the mineral at the earliest possible moment means that subsequent treatment is reduced — overgrinding to slimes is prevented — thus eliminating unnecessary additional expense, and increasing the capacity and profits of existing equipment. This gives you a higher mill recovery!

HOW THE DENVER JIG IS USED

There are five basic ways that the Denver Selective Mineral Jig increases profits: (1) it recovers values directly from the ball mill-classifier circuit, such as coarse particles of free lead, tungsten, manganese, gold, etc.; (2) it recovers fines which may be lost in the tailings; (3) it removes undesirable minerals, such as reducing the sulphur content in a fluorspar circuit; (4) it is invaluable in straight gravity concentration circuits, and (5) it upgrades the feed for subsequent treatment.

WHY THE DENVER JIG IS DIFFERENT

The Denver Selective Jig has all the essential characteristics of an ordinary jig — plus two big additional features! First, the Denver Jig is constructed so water is displaced upwards but not sucked back into the hutch. This allows free settling action, producing a clean concentrate of both coarse and fine minerals. This high recovery is obtained even when the jig is used on unclassified feed.

Second, only half as much water is used as in ordinary jigs, thus the Denver Selective Mineral Jig does not over dilute the mill circuit, eliminating subsequent dewatering equipment.

Size and capacities range from the 4"x 6" Simplex (2-6 tons/24 hrs.) to the 36"x 48" Duplex (800-1600 tons/24 hrs.).

Write or wire today — find out how a Denver Selective Mineral Jig can "recover your mineral as soon as it is free" and increase your profits and capacity.

Free Technical Bulletin Sent on Request

Over 25 years of Flotation Engineering

DENVER EQUIPMENT COMPANY

1400 SEVENTEENTH ST. DENVER 17, COLORADO

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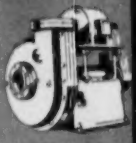
DENVER JAW CRUSHER

DENVER STEEL HEAD BALL MILL

DENVER MINERAL JIG

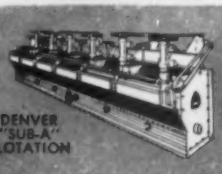
DENVER VERTICAL PUMP

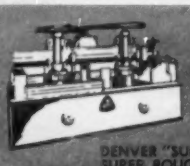

DENVER SRL PUMP

DENVER AUTOMATIC SAMPLER

DENVER STEEL HEAD ROD MILL

DENVER ORE FEEDER


DENVER "SUB-A" FLOTATION


DENVER "SUB-A" SUPER ROUGHER FLOTATION MACHINE

DENVER SUPER AGITATOR AND CONDITIONER

DENVER "SUB-A" UNIT CELL

DENVER DIAPHRAGM PUMPS

DENVER DILLON SCREEN

YOU GET MORE FOR YOUR MONEY in PACIFIC SHEAVE BLOCKS

★

TYPES AND SIZES TO SUIT EVERY MINING OPERATION

Read the pull-out captions on this cutaway view and you'll see why PACIFIC Quick-Opening Sheave Blocks offer you more for your money. Manganese steel sheaves, manganese steel side frames—work-harden for longer wear. Sheaves are kind to cable. Side plates stand up. Upkeep is nil. Load rated roller bearings for extra safety. Special grease seals. Send for Bulletin No. 238.

All blocks equipped with chained toggle pin for quick-opening.

Wide throat passes fittings, splices or square knots.

Manganese steel side frames work-harden with use. Practically impossible for cable to cut through.

Sheave rims are recessed into side frames to prevent rope fouling.

Manganese steel sheaves work-harden with use. This reduces cable wear.

Special grease seal keeps out foreign material, keeps grease in.

Roller bearings are load-rated with extra high safety factor.

Shaft and bearings assembled with positive shake-proof lock washers.

Spacer is integral part of side frame. Won't collapse against sheave, even if spacer bolt is lost.

Model CF with Hook

Model CF with Shackle

Model C with Safety Swivel Shackle

Model 6WT with Shackle

Send for Bulletin No. 238 which gives specifications on the complete line of PACIFIC Sheave Blocks. Bulletin also illustrates and describes PACIFIC Sheave Anchors.

Model C (half shroud) and Model CF (full shroud) furnished in 8", 10" and 12" sizes. Available with hook, shackle or safety swivel shackle. ★ Pacific 6WT Wide Throat Carrying Block available with shackle or hook. Toggle pins included as standard equipment. ★ ALLOY also manufactures 19" Tail Block Assemblies and 6" Standard General Utility Blocks (not illustrated).

ALLOY STEEL & METALS CO.

1848 EAST 55TH STREET, LOS ANGELES 58, CALIFORNIA

Mailing address:

Box 15323 Vernon Station, Los Angeles 58, Calif.

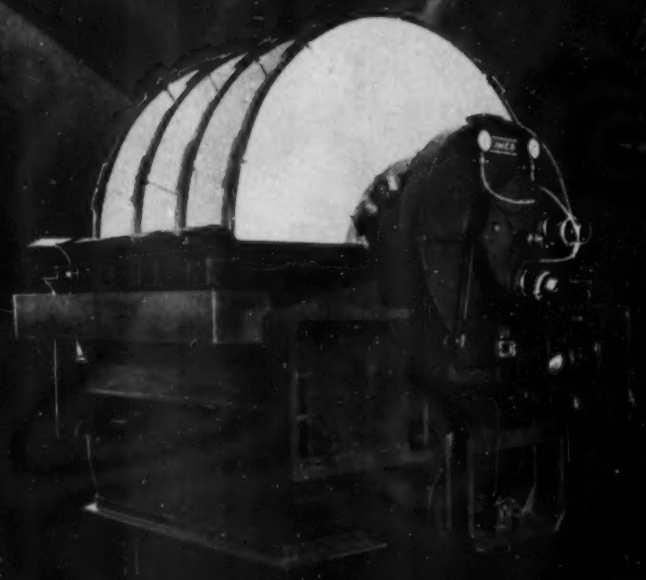
Be specific — Order PACIFIC

Jaw Crushers, "Slushmaster" Scrapers, Round-the-Corner Sheave Blocks, Bit Knockers and Wearing Parts.

ALLOY STEEL & METALS CO.

INCREASE PRODUCTION and LOWER MOISTURE CONTENT

in dewatering metallurgical slurries with fast settling solids



An EIMCO Agidisc Filter
8' Diameter x 4 Disc Unit

Two critical factors in dewatering of metallurgical slurries with fast settling particles are improved by using Eimco Agidisc Filters.

These dependable filter units have been used on many different materials with remarkable success. In the dewatering of a copper concentrate an Eimco Agidisc was installed beside a filter of standard disc design. The Agidisc produced from 20-25% more tonnage and the discharged cake contained 1½-2% less moisture.

In the same plant a metallurgical drum type filter was running on the same feed. The moisture on the Agidisc was ½ of 1% lower than on the drum filter.

Other installations are showing equally as good or better results.

Let an Eimco engineer tell you about the Agidisc. Write for a bulletin on the Agidisc to The Eimco Corporation, Box 300, Salt Lake City, Utah.

THE EIMCO CORPORATION

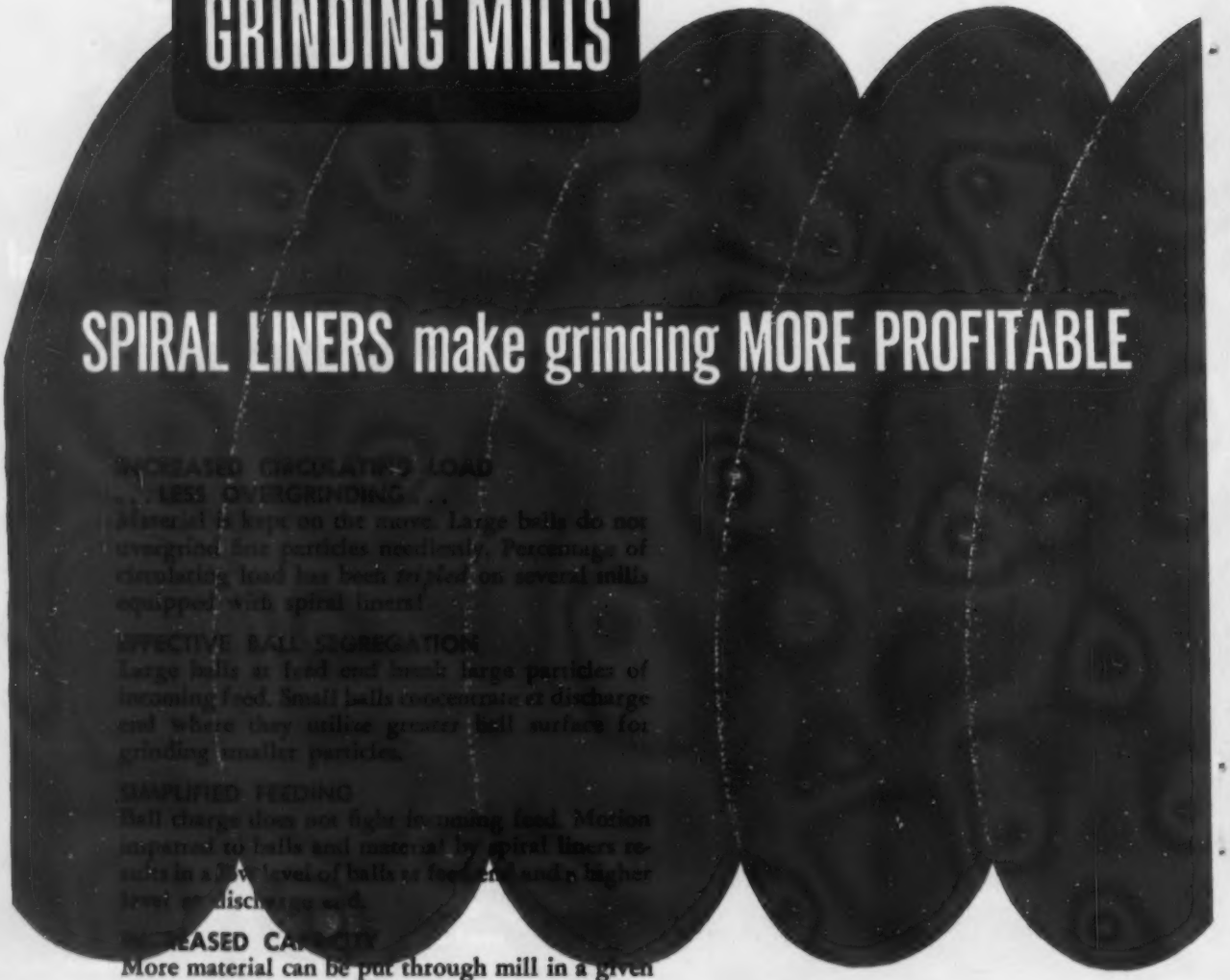
Export Offices: Eimco Bldg., 52 South St., New York City • Salt Lake City, Utah—U.S.A.

8-21

You Can't Beat An Eimco

GRINDING MILLS

SPIRAL LINERS make grinding MORE PROFITABLE



INCREASED CIRCULATING LOAD
. . . LESS OVERGRINDING . . .
Material is kept on the move. Large balls do not overgrind fine particles needlessly. Percentage of circulating load has been tripled on several mills equipped with spiral liners!

EFFECTIVE BALL SEGREGATION
Large balls at feed end break large particles of incoming feed. Small balls concentrate at discharge end where they utilize greater ball surface for grinding smaller particles.

SIMPLIFIED FEEDING
Ball charge does not fight incoming feed. Motion imparted to balls and material by spiral liners results in a low level of balls at feed end and a higher level at discharge end.

INCREASED CAPACITY
More material can be put through mill in a given time. Retention time of material in the mill is reduced. Power cost is less — no power is wasted on overgrinding . . . ball segregation increases efficiency.

For application of spiral liners to your grinding mill, call the Allis-Chalmers representative in your area, or write Allis-Chalmers, Milwaukee 1, Wis.

A-4155

ALLIS-

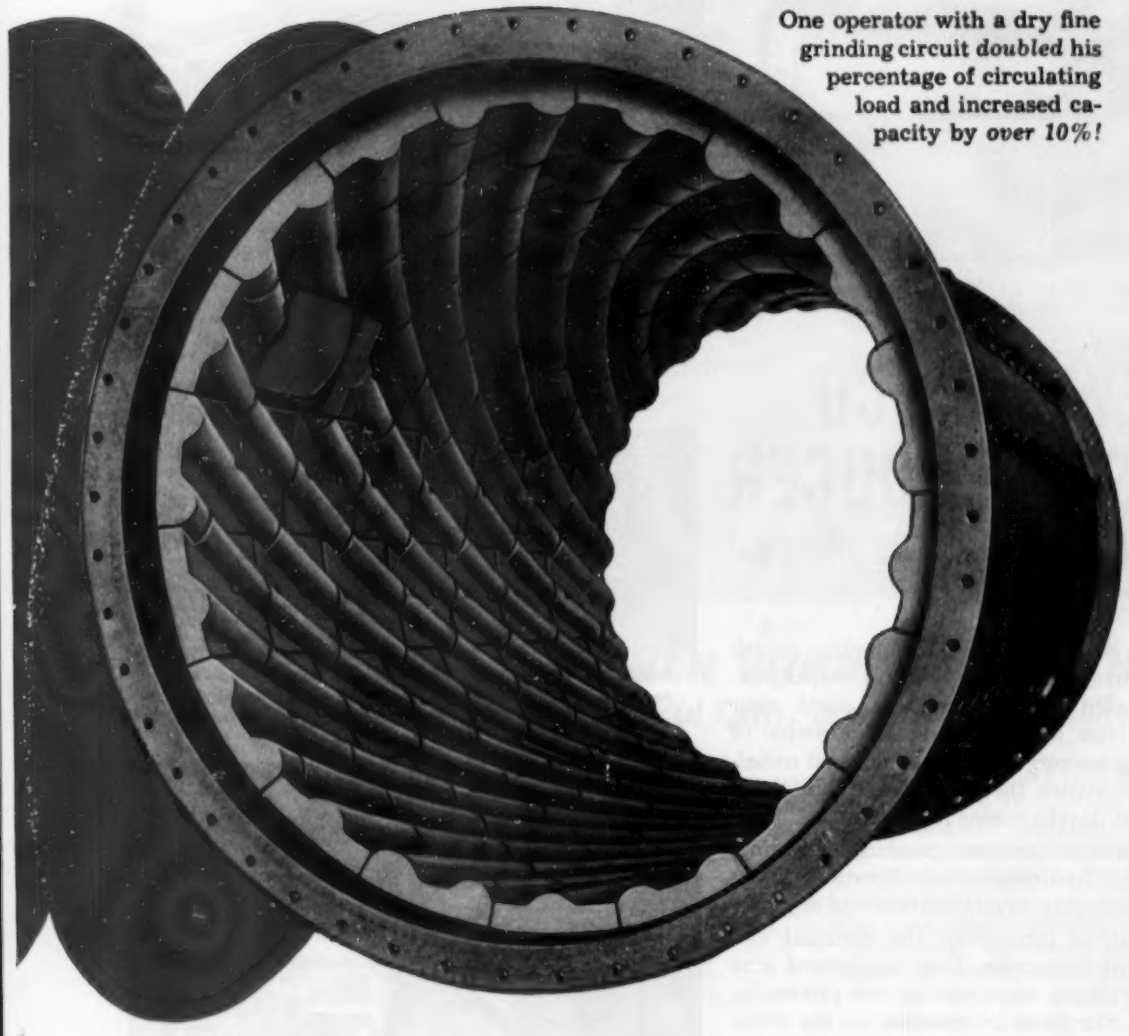
MILWAUKEE 1,

HERE ARE USER EXPERIENCES . . .

One operator with mills in a coarse wet grinding circuit *tripled* his percentage of circulating load with spiral liners.

Another wet grinding mill operator *tripled* circulating load and increased capacity by nearly 10%! Plans at this plant call for spiral liners for all ball mills.

One operator with a dry fine grinding circuit *doubled* his percentage of circulating load and increased capacity by *over 10%!*



CHALMERS

A-C ALLIS-CHALMERS

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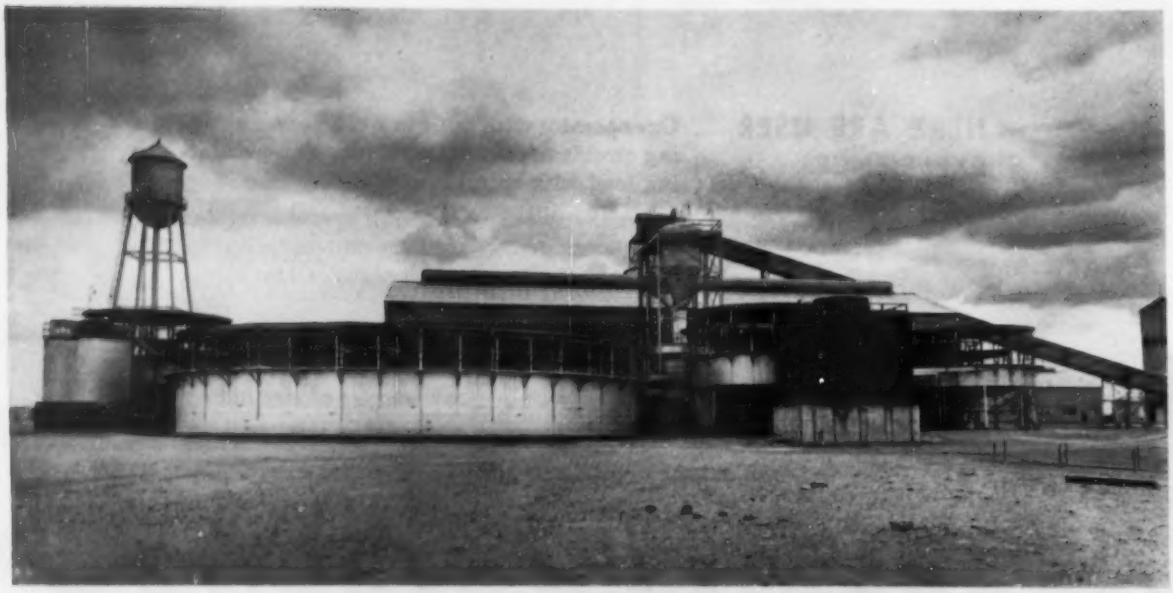


Overall view of the plant with a 120′ dia. Dorr Thickener in the left foreground handling flotation tailings. A 40′ dia. Dorr effluent Thickener and 40′ dia. Dorr Hydroseparator are at the right. All three units are covered to prevent temperature increases resulting from the sun's rays.

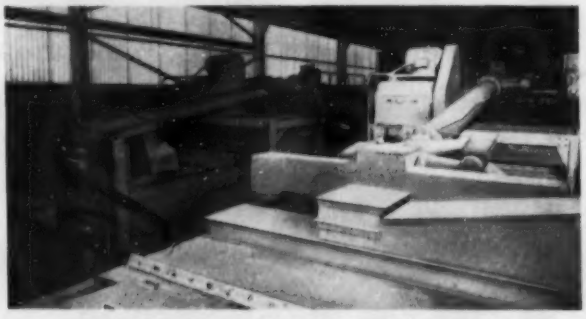
NEW MEXICO POTASH PRODUCER

Combines Chemical and Metallurgical Techniques at New Plant . . .

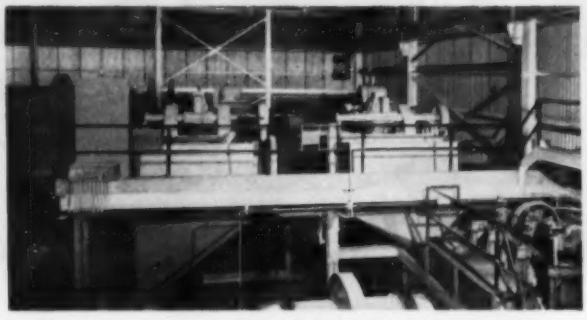
A new U. S. producer for the quality potash market, Duval Sulphur & Potash Company recently started up this modern plant near Carlsbad, New Mexico. A perfect example of the growing convergence of chemical and metallurgical techniques, the plant makes skillful use of the latest developments in both fields.

The flowsheet includes crushing, grinding, classification, hydroseparation, flotation, thickening, centrifuging, crystallization and drying.

At Duval, as throughout the chemical and metallurgical industries, Dorr equipment and techniques play a vital part in wet processing flowsheets. For more information on the scope of the Dorr technical service, write for bulletin No. 7002. The Dorr Company, Stamford, Conn. *In Canada:* 26 St. Clair Avenue, E., Toronto 5.



Closeup of two Duplex Dorr HX Classifiers. The Primary at right handles raw crushed salt which has been pulped with return brine. Sands go to a rod mill and fines to the Hydroseparator.



General view of the milling section. Rod mill discharge goes to the Secondary Classifier at the right. Sands are discharged to conditioners and fines overflow to the Hydroseparator.

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Better tools TODAY to meet tomorrow's demand

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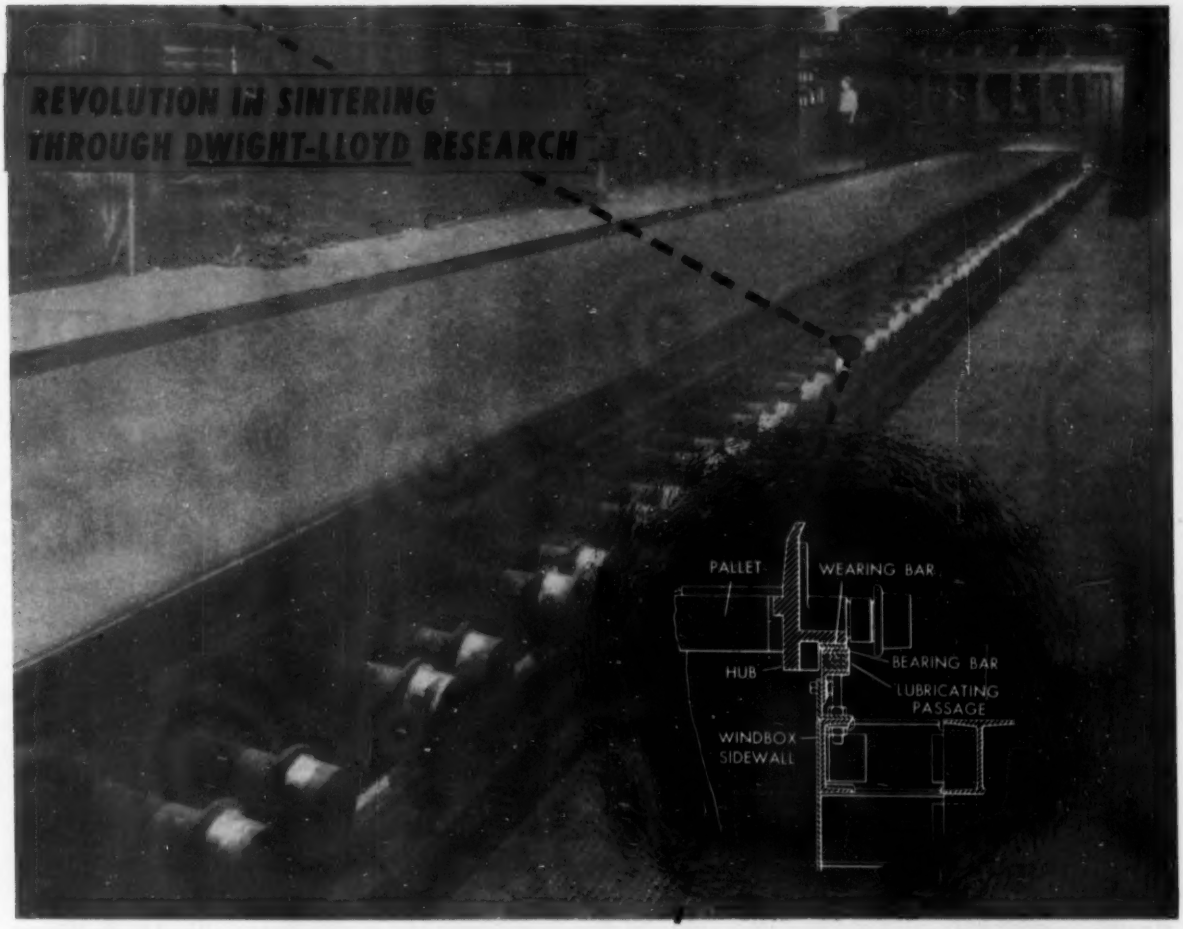


ROWEN WINDBOX SEAL HAS

Increased Production, Lowered Costs, Improved Product Uniformity

Increased sinter production, lowered costs, a more uniform product — these are the results with the use of the Rowen windbox seal on the new Dwight-Lloyd sintering machines.

The seal completely eliminates air leakage between pallets and windbox. With it, the sinter at the edge of the pallets gets the same amount of air as the sinter in the center, greatly improving the uniformity of product. Production is also increased as the burning is more efficient and the operation is, therefore, faster. Operating costs are lowered because less air is needed to do the job and because the amount of return sinter is reduced.

The Rowen windbox seal is the result of years of intensive research by our engineers. It is another major Dwight-Lloyd contribution that has maintained Dwight-Lloyd sintering as a modern, economical process.

Among the other exclusive engineering achievements incorporated in the new Dwight-Lloyd machines are:

Upper windbox — permits up-draft or down-draft operation, adding great flexibility to installation. Can be used to: recirculate hot gases, reducing fuel requirements for the charge and also lowering plant heating costs.

Discharge curve — eliminates spillage, controls pallet drop, cuts pallet wear.

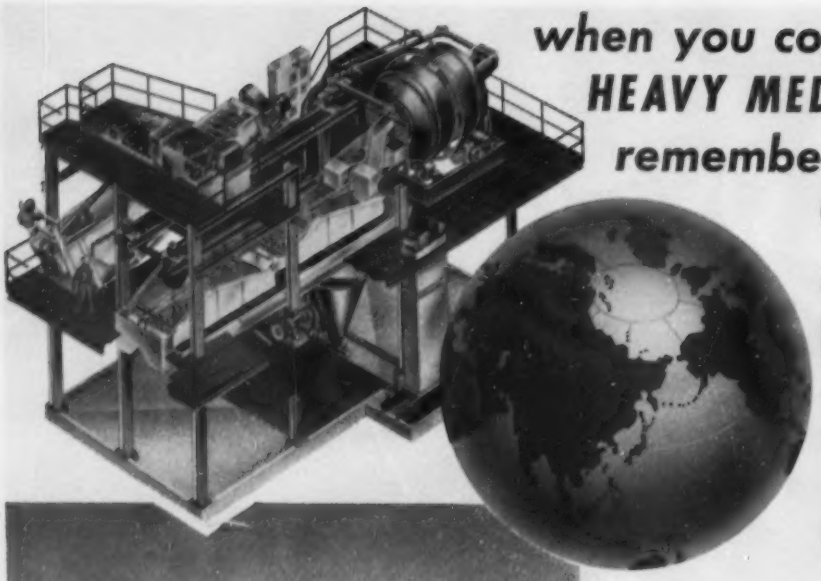
Roll feeders — assure an even distribution of charge on pallets.

Write for detailed information on the new Dwight-Lloyd sintering machines.

DWIGHT-LLOYD, Inc.

DIVISION OF SINTERING MACHINERY CORPORATION

155 Sinter Avenue, Netcong, New Jersey



when you consider HEAVY MEDIA SEPARATION remember:

OVER 50% of all HMS PLANTS are WEMCO MOBIL-MILLS

Approximately 185 Heavy-Media plants have been placed in operation or are under construction throughout the world. Of these, 100 are Wemco Mobil-Mills located in 18 states and 15 foreign countries and having an aggregate rated capacity of **50 million** tons annually. Here is remarkable proof of Wemco's design know-how and extensive experience in the Heavy-Media Separation field.

Consistent, economical concentration of ores amenable to Heavy-Media Separation is offered by the Wemco Mobil-Mill. The superior design of this unit gives accurate control of media density and positive sink removal. It assures higher grade concentrate and lower tailings with operating costs as low as 15 cents per ton of feed. A partial list of ores being efficiently treated by Wemco Mobil-Mills includes:

LEAD	COPPER	MANGANESE
ZINC	DOLOMITE	COAL
IRON	BARITE	AGGREGATES
FLUORSPAR	BRUCITE	DIAMONDS

CUSTOM BUILT PLANTS

Wemco's extensive engineering and equipment experience is your assurance of our ability to design and install complete custom built beneficiation plants for any type mineral amenable to concentration by Heavy-Media Separation.

RENT OR PURCHASE WEMCO MOBIL-MILLS

Take advantage of Wemco's rental, rental/option to purchase, or outright purchase plans.

Write today for Bulletin M-3-M-5 and further information on the use of Mobil-Mills in mineral engineering practices.

Mobil-Mills • Coal Spirals • HMS Thickeners • HMS Pumps • Sand Pumps • Agitators
Cone Separators • Drum Separators • Hydroseparators • Fagergren Laboratory Units
Fagergren & Steffenson Flotation Machines • S-H Classifiers • Attrition Machines
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Check these important MOBIL-MILL features

- **Prefabricated, ready to install.**
- **Fast installation at the plant site.**
- **Minimum initial and operating costs.**
- **Clean separation, higher recovery.**

Mobil-Mills are furnished in five basic sizes and several models with smaller or larger plants varying in capacity from 5 to 275 TPH. Each plant is equipped with a choice of one of the following type separators to meet your particular requirements:

1. **WEMCO SINGLE DRUM** gives positive sink removal and efficient control of media density for one stage separation over a wide range of size fractions.
2. **WEMCO TWO-COMPARTMENT DRUM** gives two stage separation in a single unit for treating ores having a middling component.
3. **WEMCO CONE SEPARATOR** gives efficient, low cost separation with ores where a fixed range of feed sizes requires greater volume of medium.

THUNE

Magnetic Separators, Sydvaranger permanent

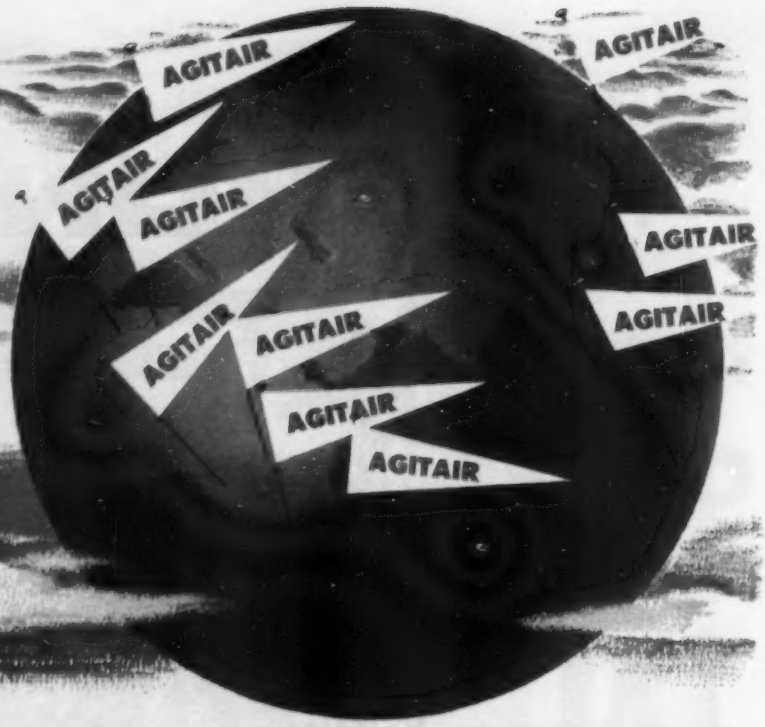
Lifting Magnets
Magnetic Drums
Magnetic Clutches
Magnetic Pulleys

A new type of magnetic separator for the mining industry has been developed by us, in conjunction with mining interests in the country.
Already in operation in various parts of Norway, the new separator is being used for dressing and extracting iron ore by either the wet or dry processes and for the removal of unwanted ferrous content from other ores. The system is based on the use of a permanent magnet and the equipment is quite independent of electric current. The residue leaves the separator with a content of over 70% of solids which can be passed on to secondary mills and refineries for further treatment and dressing.

Abt. 130 Separators (600 mm diameter x 1735 mm) delivered and/or in hand for the mining industry, including 87 Separators for A/S Sydvaranger.

A. S. THUNES MEK. VAERKSTED, Oslo, Norway

AGITAIR IS THERE!



You can choose with assurance..the Flotation Machine so successfully used in mining centers throughout the world

Agitair Flotation is used in so many farflung places because it adapts so readily and efficiently to the varied problems of ore beneficiation encountered in the field of metallurgy. Flexibility is the key to its remarkable success. Its mill application to all basic metals is now engineering routine. Its capacity to meet unusual demands is a challenge it welcomes.

Planned to fit the plant

Cell capacities and connected unit assemblies meet the physical requirements of all mills . . . large or small. Its recovery quotient is high . . . its power consumption low. Simple design and rugged construction insure long, trouble-free use. For complete information on AGITAIR, write your request today.

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Agents in All Principal Foreign Mining Districts

CONSULTATION • ORE TESTING
PLANT DESIGN • GEOLOGIC INVESTIGATION

WHY WASTE TIME CHANGING STEELS WHEN YOU CHANGE BIT TYPES?

Dozens of different Timken® multi-use and carbide insert bits fit the same drill steel!

DO your men have to waste time going after a different set of drill steels every time a different type bit is needed? If so, you can save valuable drilling time by using Timken® interchangeable rock bits. Because dozens of different Timken multi-use and carbide insert bits fit the *same* drill steel, you can change bit types in less than one minute. That's all it takes to unscrew one Timken rock bit and screw on a different type.

You reduce costs further because you can cut your drill steel inventory. And your drillers can always switch to the most economical bit as the ground changes—right on the job!

Both Timken multi-use and carbide insert bits are made from electric furnace Timken fine alloy steel, have special shoulder unions that keep drilling impact from damaging threads.

Our rock bit engineers will be glad to run a test in your mine to determine the rock bits best suited to solve your particular drilling problems. There's no obligation. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

WHERE YOU CUT COSTS WITH TIMKEN MULTI-USE BITS

Most economical for rock of average hardness. With correct and controlled reconditioning, they give lowest cost per foot of hole when full increments of steel can be drilled.

WHERE YOU CUT COSTS WITH TIMKEN CARBIDE INSERT BITS

Give highest speed through hardest, abrasive rock. Also most economical for constant-gage holes, small diameter holes, very deep holes.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

... your best bet for the best bit ... for every job

It costs time and money to be ONE DIPPER LATE!

Amsco manganese steel dippers are regularly ordered for replacement on equipment in the field. Often they go to users who found that ordinary steel dippers simply would not hold up.

It's smart economy to specify tough, dependable Amsco dippers with original equipment.

Next time you order a power shovel or a replacement dipper, specify long life right on your purchase order . . . specify an Amsco manganese steel dipper.

American Brake Shoe

AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Ill.

Load lines and boom lines on this shovel are just some of the many uses for tough, long-lasting Tiger Brand Wire Rope. Draglines, dipper hoist ropes, scraper and dump lines are also applications where Tiger Brand Wire Rope helps to keep down costs and give long, dependable service.

Tiger Brand Wire Rope lasts longer, cuts costs!

Sound basic engineering and close supervision of manufacturing practices are just two of the reasons why Tiger Brand Wire Rope wears evenly, resists abrasion. Crane and shovel operators like the ease of handling Tiger Brand. And because it gives such good service under all conditions, "down time" is reduced to a minimum.

Services of a Tiger Brand Representative and Tiger Brand Field Engineers are always available to help solve your wire rope problems. If your wire rope application is an unusual one — or its operating conditions are severe — they will make specific recommendations for your equipment and conditions of service.

To cut costs on all of your wire rope operations, rely on extra tough American Tiger Brand, the wire rope that is rigidly controlled by United States Steel from raw ore to finished product. For further information or field service, contact your local distributor, or write Columbia-Geneva Steel Division, United States Steel Corporation, 1403 Russ Building, San Francisco 6.

USS TIGER BRAND Wire Rope

United States Steel Corporation · Columbia-Geneva Steel Division
In the East: American Steel and Wire Division

UNITED STATES STEEL

SANFORD-DAY builds an Improved Granby Mine Car . . .

Briefly, this new S-D Granby Car features: (1) outside frame undercarriage, (2) outside spring truck boxings, (3) automatic coupler mounting, (4) stronger body and (5) all-welded design in which each member serves one or more purposes.

Some of the advantages of these features are: greater capacity for any specified dimensions because body hinge points are located outside of wheels . . . better trackability and stability on narrow gauges because the low bottom and wide frame give a low center of gravity . . . easy access to all parts of truck and boxing for maintenance because entire axle, wheels, boxings and spring assembly may be dropped out of frame by removal of only eight bolts . . . maximum shock absorption for any shock or load condition . . . no pinching of bearings . . . no weak spots . . . heavy ¾" bottom plate giving longer life and lower maintenance. Valley angles, gussets, vertical and horizontal stiffeners are used on the body for maximum strength. The all-welded construction is designed so that all joints and connections equal parent metal strength.

If you are now contemplating the purchase of new Granby Cars, it will pay you to get complete specifications and construction data on this improved car.

Here's simple and practical construction. Remove four pins and eight bolts and the S-D Granby Car can be completely disassembled in 10 minutes.

SANFORD-DAY IRON WORKS, Knoxville 17, Tenn.

WARD LEONARD ELECTRIC or DIESEL

The new 480-W incorporates advanced design features that have been field-proved through years of service in other Bucyrus-Erie walking draglines. It is a big-yardage, all-weather machine, built for year-after-year profitable operation.

LONG WORKING RANGE — Moves material 431 ft. with 215-ft. boom and 8-yd. bucket without throwing bucket; 395 ft. with 195-ft. boom and 10-yd. bucket; and 359 ft. with 175-ft. boom and 12-yd. bucket. Digging depths range up to 141 ft.

EASILY MANEUVERED into best working position with exclusive Bucyrus-Erie walking mechanism.

ALL-WEATHER WORKER — Bearing area is large to permit working on soft ground. Weight and loads are balanced so center of gravity shifts through limited range, keeping base rim pressures low.

MAIN MACHINERY IS SIMPLE, and is firmly held in alignment on strong frame. Minimum of moving parts means low maintenance.

ALL-WELDED, TUBULAR-BRACED BOOM provides plenty of strength without excess weight.

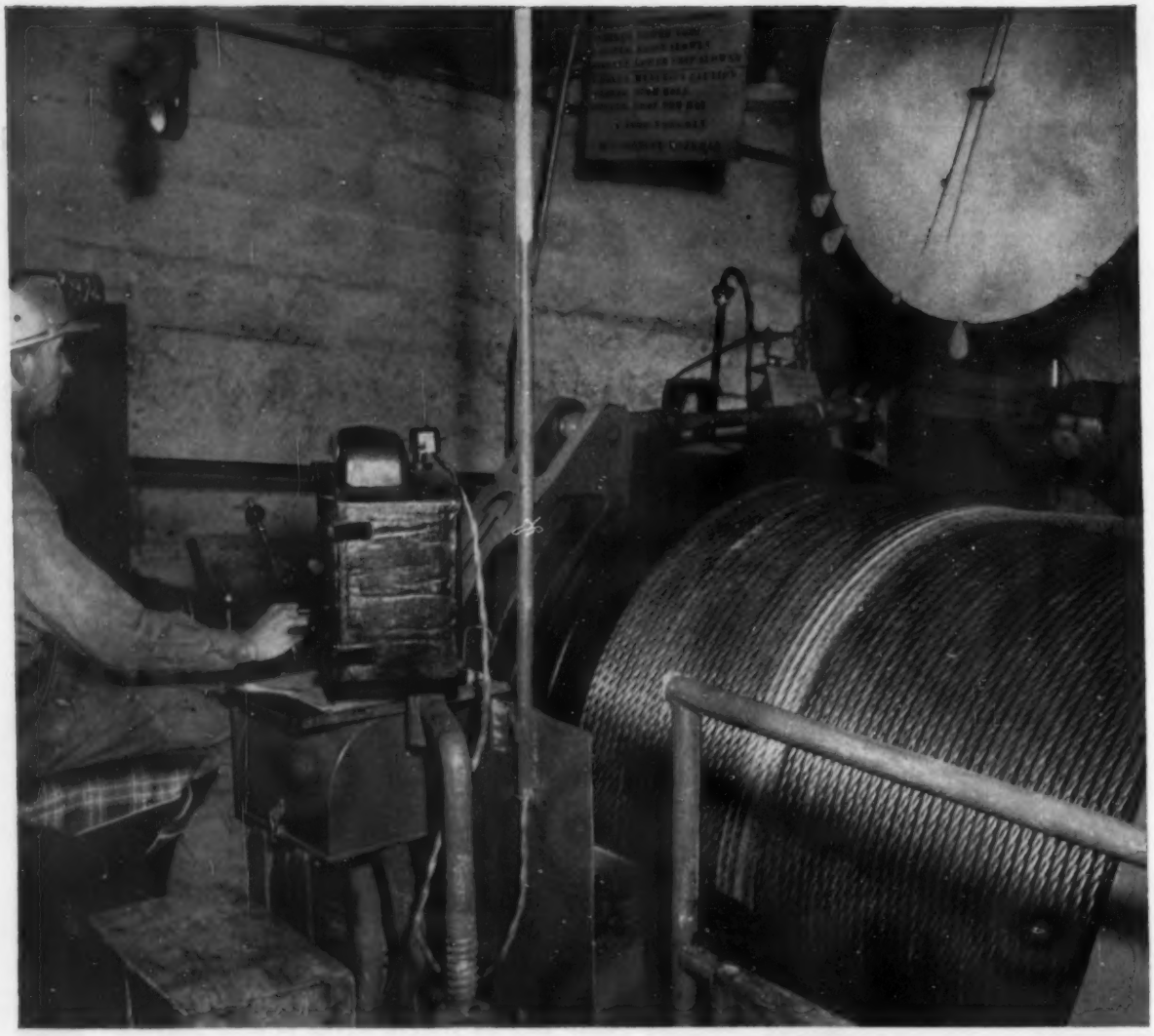
BIG OUTPUT results from dependable, year-round performance, fast moves, and rapid work cycle.

You are invited to send for additional information on how the 480-W can help you solve stripping or other long range excavating problems.

BUCYRUS ERIE

46L53C

BUCYRUS-ERIE COMPANY SOUTH MILWAUKEE, WISCONSIN



Wire Rope at Work — Here's neatly spooled wire rope in the busy hoist house of a coal mine in Utah. It's some 9,000 ft of 1¼-in. Bethlehem Special Slope Hoist Rope made of improved plow steel. On this operation, as on many others in mines throughout the Western states, Bethlehem wire rope is giving the same reliable performance you can always expect of it on any hauling or lifting work, no matter how tough.

BETHLEHEM PACIFIC COAST STEEL CORPORATION

Sales Offices: San Francisco, Los Angeles, Portland, Spokane, Seattle

Wire Rope Depots: San Francisco, Seattle

BETHLEHEM PACIFIC

BIG LOADS RIDE EASY ON A Mack's BROAD SHOULDERS

It will pay you to find out what Mack six-wheel trucks can do to save money and boost profits on your job through unfaltering traction and faster, uninterrupted schedules.

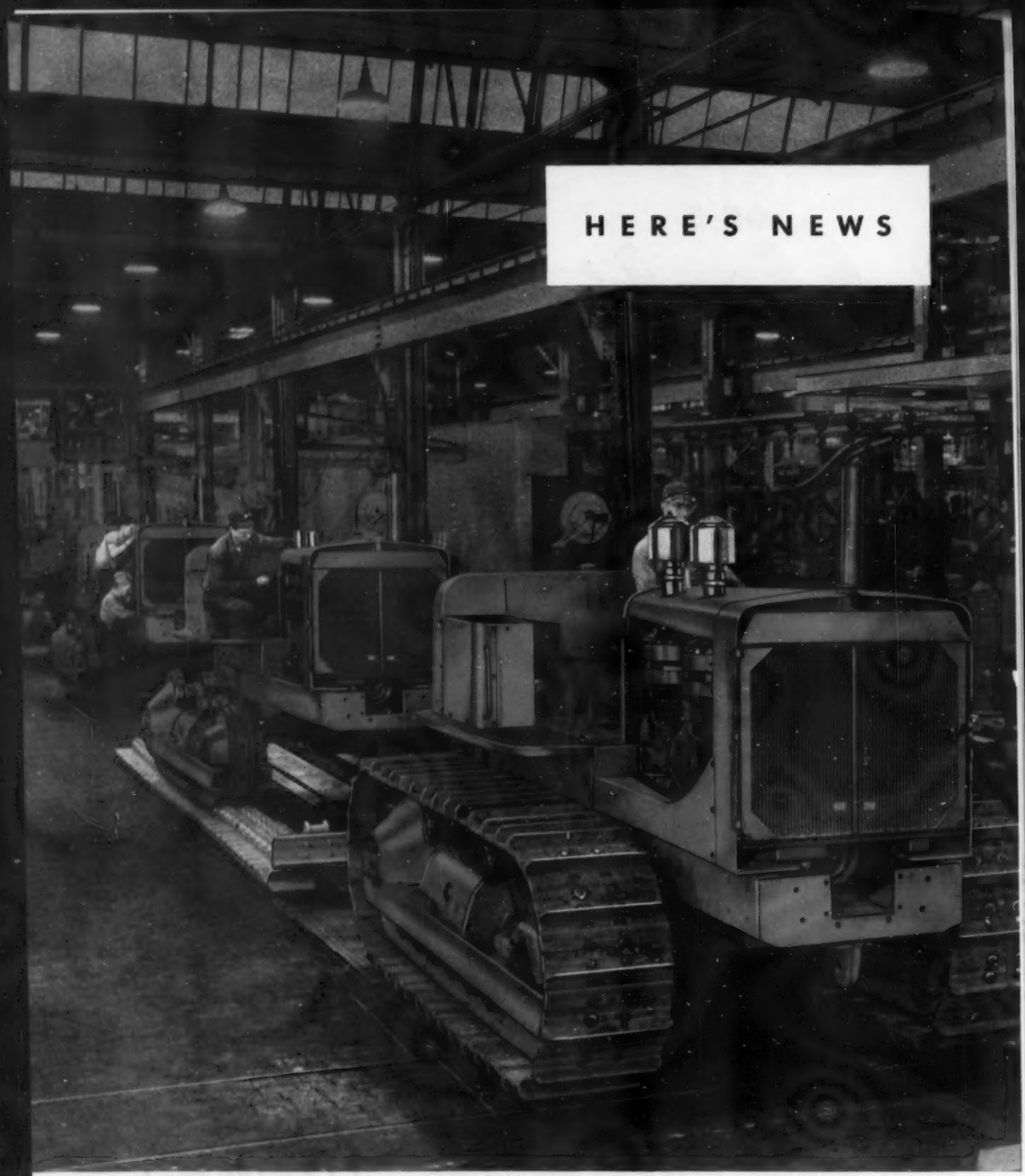
That's because only Mack six-wheelers boast the unique advantages of Mack's exclusive Balanced Bogie and Power Divider . . . with all the benefits they give you in maximum flexibility, even tire loading, uniform braking, simplicity of design and positive traction regardless of the toughest terrain.

Write to us today for your free copy of booklet describing the Mack Balanced Bogie with Power Divider, or contact your nearest Mack branch or distributor.

Mack TRUCKS

. . . outlast them all

Mack Trucks, Empire State Building, New York 1, N. Y. Factory branches and distributors in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.



They're here now! **28,000-lb. HD-15's with torque converter drive are already rolling off the assembly line.**

Allis-Chalmers Powerful HD-15 adds to its big work advantages

. . . now offers choice of two outstanding drives—

standard transmission with time-saving shift pattern,

or widely accepted hydraulic torque converter drive

From its introduction, the Allis-Chalmers HD-15 has set new standards in performance and long-life service . . . in a new size class. It combines outstanding strength and balance with plenty of power, plus a simplified, time-saving transmission that gives big work output. In addition, the HD-15 offers remarkable service simplicity, with features like unit assembly and 1,000-hour lubrication intervals for truck wheels, idlers, and support rollers. It has proved itself the kind of tractor required on today's jobs.

Now, hydraulic torque converter drive is added as optional equipment — an additional working advantage for the powerful HD-15. This advanced design drive was introduced by Allis-Chalmers in the world's *first* torque converter tractor nine years ago. This modern drive gets more done because it automatically provides the right combination of speed and pull every working minute . . . and hydraulic cushioning assures longer life for both tractor and auxiliary equipment.

Now you can choose the HD-15 with standard transmission *or* hydraulic torque converter drive. Either way you'll be getting the most advanced tractor in the business. Let your Allis-Chalmers dealer give you *all* the reasons why.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

TORQUE CONVERTER

Symbol of greater output, longer life.

UNOBA lubricates bearings in this!

If ever a grease had a tough and important job to do, UNOBA has it here in this large Idaho concentrator.*

For UNOBA must lubricate the lower bearings of screw classifiers submerged in this heavy mixture of finely ground ore and acidic water—protect these vital parts against rust, corrosion and abrasive action.

Where ordinary greases are prone to fail under such conditions, emulsify and flow out of bearings into the float cells (jeopardizing the machinery by its absence and mineral recovery by its presence in the flotation circuit)... UNOBA "stays put" to lubricate and protect these bearings.

Does *your* operation require a grease that can *really take it?* Ask your Union Oil representative to supply you with UNOBA *multipurpose* grease.

**Name on request.*

UNION OIL 76 COMPANY

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—Drifts and Crosscuts—

New Field Editor—Stanley Dayton, new field editor, joined the staff of MINING WORLD in January.

Stan hails from the Northwest and calls Pullman, Washington his home. Following his graduation from high school, he entered college and completed 1½ years before entering the United States Navy in 1943. He served as a gunnery and communications officer aboard a tanker during World War II. He returned to his studies in 1946, and was graduated from the State College of Washington with Bachelor of Science degrees in Mining and Metallurgical Engineering in June 1950.

As an undergraduate, Stan spent his summer vacations working as a miner and mill operator at various operations in the Coeur d'Alenes, Idaho and at Metaline Falls, Washington. After receiving his diploma, he went to work for the Nancy Lee Mining Company at Superior, Montana where an exploration project was under way. In the early stages of the project, he had charge of all mine surveying and mapping, and assisted with the geological mapping and interpretation. Later he took charge of the 100-ton flotation concentrator, and divided his time between the mill and supervision of mining activities. He joined the engineering staff of the Anaconda Copper Mining Company at Butte in March 1952. His experience there was chiefly in block caving, having been employed on the Greater Butte Project.

He is a dyed-in-the-wool sports fan and his hobbies include hunting, fishing, golf, and handball. His addition to the staff of MINING WORLD provides the magazine with men experienced in mining operations throughout the country—the Rocky Mountains, the Southwest, the Iron Ranges, and the Northwestern states.

New Land Policy—A return to the will and policy of the United States Congress in regard to mining claims as codified in the laws of the United States is a new policy of the Department of the Interior.

In a speech in Seattle, Washington, in December 1953, Orme Lewis, Assistant Secretary of the Interior for Public Land Management, outlined what mining men hope will be the policy of the Administration in regard to Public Lands and their uses. Among the points in his speech are the following:

"Sometimes our lands are more *valuable* in private hands, contributing more to the national economy, than in those of the federal government. This was the thinking which guided Congress into the enactment of laws by which individual Americans could acquire lands and homes and futures in the public domain.

"We seek in our concept of conservation and our administration of public lands to return to the policy and will of Congress as expressed in its laws giving individual Americans access to the public domain where it appears that placing of such lands in private hands will best serve the national economy and the long-term public interest. In short, we seek to reverse the trend toward increasing land-holding by the federal government.

"This concept has been mistreated by some administrators in the past."

(Mr. Lewis did not particularize, but many miners know that it was Ickes' policy to increase federal control of lands. In the not too distant past, federal administrators advocated weakening and changing of the mining laws so that a system of leasing, regulation, and control over mineral deposits could be established.)

Of equal importance is the proper utilization and conservation of mineral resources as outlined by Secretary Lewis.

"We hold that successful conservation is not, and need not be, synonymous with federal control and ownership.

"The federal authority can do a *better* job if its efforts are limited to those fields where federal administration can do the *best* job, while states and private individuals and interests should be permitted to handle those aspects of conservation for which they are specially fitted, in which they can be most effective, and through which the public interest can best be served.

"We hold that *the federal government is not the sole and only competent manager of our resources.*

"Conservation is a business for us *all*—a challenge to all Americans; but we must see our objectives clearly. We must not jeopardize our resources; and this need not be under proper-use conservation."

There is much hope in these plans. The mining industry has long wanted efficient, impartial administration of the existing mining laws—not changes or increased federal controls.

Did You Change Your Address Recently?—Many miners have and more are moving daily. Its the nature of the mining business. Therefore the latest ruling of the United States Post Office Department regarding delivery of MINING WORLD is important. Under the new rules the Post Office will forward your magazine for only three months. If you have moved to a new address in the same city it will do this free. If you move to a new address and leave a forwarding address your copy will be forwarded only if you agree to pay postage. Postage is now charged at fourth-class zone rates instead of second-class. This means that an average sized issue will require forwarding postage of about 15 cents for about 800 miles. For a special issue, or a longer distance, it will cost much more to forward a copy.

If the subscriber (you) doesn't advance the postage, and, in any event, only for three months does the Post Office return the wrapper to the printer so that we can attempt to find your new address. After three months no returns are made.

This means that it is imperative that you advise of any changes of address before you move so that you won't miss a single issue of your favorite mining magazine.

NOW!

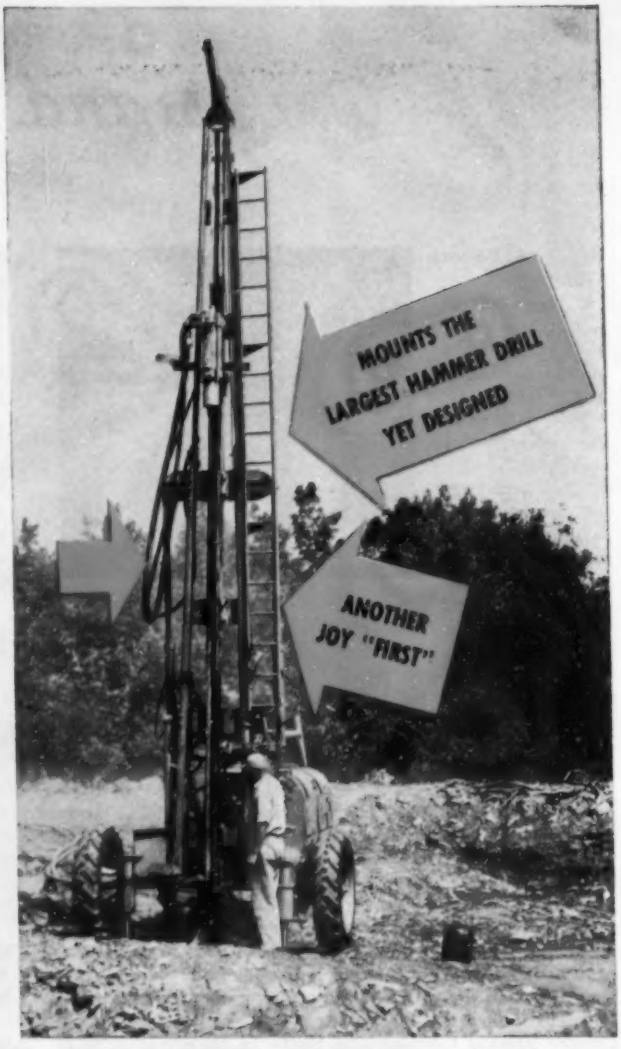
you can get big drill performance with the

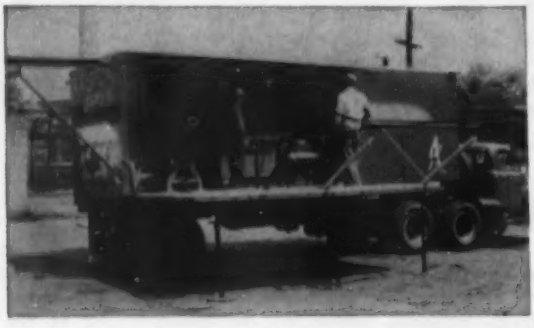
CHALLENGER
Blast Hole Drill

HERE'S WHAT USERS SAY:

"Drilling cost per ton of ore broken reduced by two-thirds over wagon drills. Driller experience can further reduce to one-sixth of wagon drilling cost."

"Punched down four 60′ holes, bottoming at 4″ dia., in one shift. What a drill!"





SPECIAL DRILL AND STEEL SERVICE

The size of the Challenger Drill and the sectional steel used with it, makes necessary special drill and steel service which is provided by Joy. Service trucks, like the one shown here, make periodic visits in areas where Challenger Drills are operating. The operators of this "mobile shop" are experienced drill doctors who furnish complete drill steel service, bit sharpening service, drill inspection, and suggestions for use and application of the drill for best results.

Users' reports on early units show that you really get big drill performance with the Challenger Drill. It's a 5¼″ hammer drill (not a piston drill) that drills 4½″ diameter holes through hardest rock to depths of 50′ or more. This big drill performance calls for a 26′ feed to cut the number of steel changes, and a self-propelled mounting. Tractor-mounted on rubber tires with a portable compressor to furnish air for drilling, the Joy Challenger is the biggest cost-cutting big drill for hard rock drilling. Check your needs . . . see if this big drill won't answer your problems. ● ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

JOY

WORLD'S LARGEST BUILDER OF CORE DRILLS, ROTARY BLAST HOLE DRILLS AND MOTORIZED DRILL RIGS

WBD C 4938

CAPITOL CONCENTRATES

SPECIAL DIVISION OF SBA MAY BE ORGANIZED FOR MINE LOANS

It is understood that the Small Business Administration, because of urging by United States Senator Barry Goldwater of Arizona, is setting up a special division to deal with mine loans. However, unless SBA's general loan policies are greatly changed it is hard to see how mines can expect to get favorable treatment. Many peculiar situations are involved which take the small mining enterprises out of the catagory of the ordinary small business concerns.

When SBA has processed enough applications and the results are made public, it will be known whether or not western Senators and Representatives will have to press for a special amendment to the SBA Act to take care of mining applicants.

• *More Money For CCC*

Mining people have noted with interest that the Commodity Credit Corporation on January 25, 1954, was nearly broke—down to its last $16,000,000 to be exact, or just enough money for three or four days' operation. Price-support loans to farmers had used up $6,734,000 of its $6,750,000 authority. Don't worry though, for Congress was hurrying to supply the money to relieve this desperate situation and by now everything should be O.K. How's your mine getting along?

• *Little Comfort In Randall Report*

The report of the Randall Commission on Foreign Economic Policy takes the position that we should continue to encourage production of strategic materials abroad. As regards such materials, says the report, our tariffs should be determined on economic grounds, leaving domestic production for defense to be promoted by other means out of the defense budget. Page ODM Director Flemming! When western Senators suggested to Flemming that the lead and zinc industry be supported under the clear authority of the Defense Production Act, he answered that it was not in the interest of the national defense to do so.

• *No Help For Zinc Mines*

The plight of our zinc operators is illustrated by a letter to members of the Congress from the Silver City, New Mexico, Chamber of Commerce, which said: "Whereas there were 26 mines producing zinc two years ago, now not a pound of zinc is being produced in this state." Similar reports are being received from all over the country, although the shutdowns in most areas are not quite so complete.

Wool may be subsidized on the grounds that it is a strategic material and we must protect our domestic sources, and many other industries are directly or indirectly subsidized by the government on one pretext or another. But the mining industry, which is basic to either our civilian or wartime economy, merely gets kicked in the pants. When will mining hang together, protest vigorously to Congress, and get something constructive done?

ODM Director Flemming already has stated his agency does not consider lead and zinc mining to be essential to the national defense. The Administration has ruled out tariffs and probably will oppose import quotas. Prices are dropping further and nothing is being done. *Sic transit gloria*—mining!

• *Bill Provides For Agricultural Entry*

The House of Representatives has passed and sent to the Senate H. R. 3306, an act to provide for agricultural entry on lands withdrawn, classified or reported as containing phosphate, nitrate, potash, oil, gas or asphaltic minerals, with an amendment exempting deposits of fissionable materials.

• *Hearings On Gold Bills Are Planned*

It may be expected that Chairman Capehart of the Senate Banking and Currency Committee will soon call hearings on a group of gold bills now before the Congress. The committee's staff is said to be working up a list of witnesses from industry and the Treasury Department, as well as groups of economists, to give the situation a thorough airing. The McCarran-Engle bill to restore a free market for newly mined domestic gold will be one of the first to receive the treatment. The Treasury experts are expected to be thumbs down on all the bills.

• *Request Made For Operating Subsidy*

The States Marine Corporation of New York and Delaware has asked for an operating subsidy on trade routes from Atlantic, Gulf, and Pacific coast ports to the Far East, Europe, and the Mediterranean. Presumably, States Marine wants to haul to the United States such items as minerals on which the domestic producer has no subsidy.

• *Government Committees Continue Their Studies*

According to the U. S. Bureau of Mines, "Several government committees were studying the problems of the zinc and lead mining industries as the year (1953) ended, preparatory to making recommendations in 1954." These recommendations will no doubt be made to the President's Mineral Policy Committee, which is expected to come out with some vague and wishy-washy statements later this year. If there is one thing which all administrations discover very soon, it is that miners don't have many votes and won't stick together with what they have.

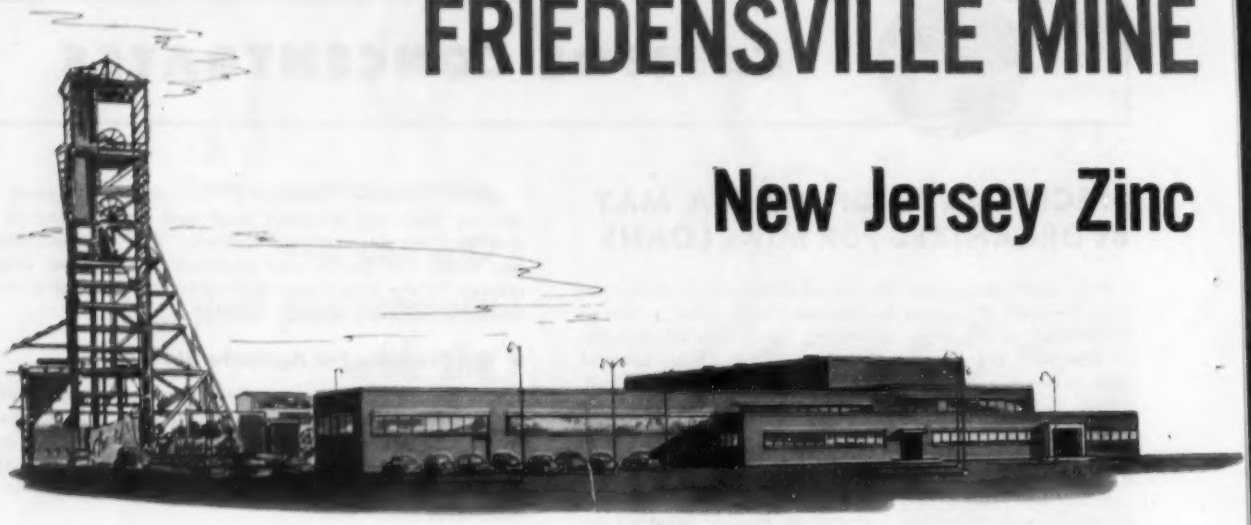
• *Butter For Minerals*

Government agencies are said to be investigating a plan to trade some of our quarter of a billion pounds of surplus butter for Soviet strategic and critical minerals. The butter, purchased under a price support plan, soon will be good for nothing but axle grease. The Soviet minerals, put into our stockpiles, won't spoil. Domestically produced strategic and critical minerals wouldn't spoil either!

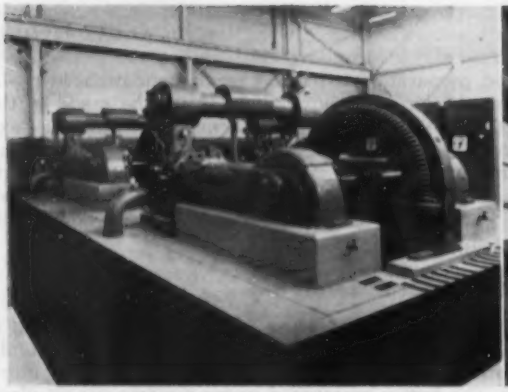
(*Continued on page* 36)

FRIEDENSVILLE MINE

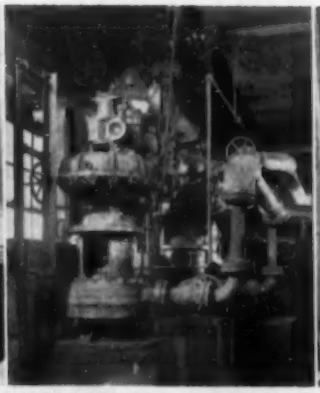
New Jersey Zinc



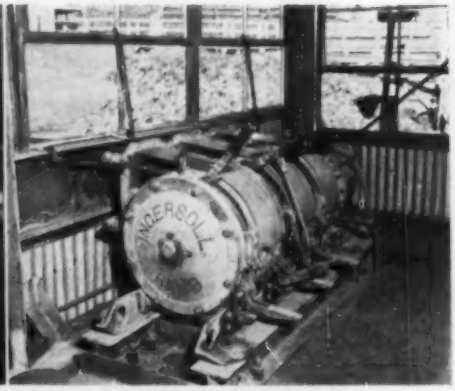
Here, as in all other New Jersey Zinc mines and smelters, I-R equipment has been specified for dependable, long-range performance



Two of three 21-inch PRE Ingersoll-Rand compressors which will be the nucleus of the central compressor plant at Friedensville.



Two VHT high pressure boiler feed pumps at the Palmerton smelting plant of the New Jersey Zinc Company.



Three-drum, Model 20NNN 2D slusher hoist being used to deliver ore to crusher at Hanover, New Mexico mine.

marks new development in

EXPANSION PROGRAM

LOCATED in eastern Pennsylvania's Saucon Valley, the Friedensville project will tap large reserves of zinc ore. The main shaft, sunk to a depth of 1260 feet, has been completed. The permanent headframe is in place, the mine buildings are finished and installation of the machinery and equipment is well underway.

Compressed air for the new plant is supplied by three Ingersoll-Rand 21-inch Class PRE compressors, two of which are shown below at the left. Each unit is rated 2700 cfm, 100 psi, and is driven by a 500-hp, 180 rpm direct-connected synchronous motor.

The performance of Ingersoll-Rand equipment is well known to the New Jersey Zinc Company. For I-R stationary and portable air compressors, pumps, air hoists, pneumatic tools, Jackhamers, paving breakers, wagon drills, Jackdrills and stopers are serving throughout this vast mining operation—including the mines at Franklin, Ogdensburg, Austinville, Gilman and Hanover and the plants at Palmerton, Depue and Canon City. A few representative items of I-R equipment in use at New Jersey Zinc Company properties are shown below.

Like so many leading metal and non-metal mines throughout the world, New Jersey Zinc has found that I-R equipment can be installed with complete confidence in its ability to stand up year after year on the toughest jobs. That, of course, contributes to sustained high production—reduced operating and maintenance expense.

Ingersoll-Rand

11 Broadway, New York 4, N.Y.

COMPRESSORS
AIR TOOLS • ROCK DRILLS
TURBO BLOWERS
CONDENSERS
CENTRIFUGAL PUMPS
DIESEL AND GAS ENGINES

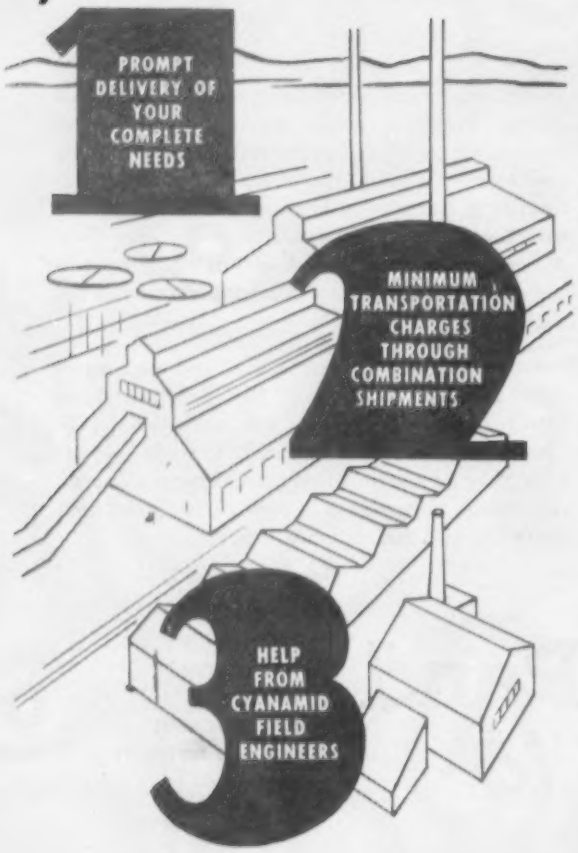
Ingersoll-Rand Model X71-WD Wagon Drill in use on open pit mining at New Jersey Zinc operations in New Mexico.

A Model JR38 Jackdrill at work in stope drilling using ⅞-inch Hexagon steel with Carset Jackbits.

Ingersoll-Rand DB30 Drifters driving a Drift heading at Hanover, New Mexico.

991-14

YOU GET ALL 3 WHEN YOU ORDER *Cyanamid* REAGENTS



Cyanamid . . . and only Cyanamid . . . offers a complete line of Cyanidation and Flotation Reagents and auxiliary metallurgical chemicals. To serve you promptly as well as economically, we maintain strategically-located stocks in the West and Southwest. Orders may be placed with our New York office or with American Cyanamid Company, 1440 Broadway, Oakland 12, California; El Paso, Texas; c/o Weicker Transfer & Storage Co., Denver, Colorado; or c/o Goodwin & Mayflower Moving & Storage Co., Spokane, Washington.

AMERICAN Cyanamid COMPANY

MINERAL DRESSING DIVISION

30 ROCKEFELLER PLAZA, NEW YORK 20, NEW YORK

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Capitol Concentrates

(*Continued from page 33*)

• *Is It Another Secret Weapon?*

The Munitions Board did a right good job in stockpiling feathers which, as anyone knows, are essential to winning a war. Representative Bender of Ohio says, "It is known that the standard or regular-size mountain sleeping bag is made of some 49 ounces of feathers. We have enough to sleep the entire American population on top of Pike's Peak longer than Rip Van Winkle. The king-size arctic bag contains some 87 fluffy ounces of feathers. We have enough of these insides available to move the population of South America up to the North Pole from the equatorial tropics without their noticing the change in temperature."

As feathers would make poor bullets, the reason for stockpiling more than enough to bed down the Armed Services seems somewhat obscure. Or, wait a minute. Perhaps we are developing another secret weapon!

• *Is U. S. Chamber Going International*

The use of tax incentives to encourage direct overseas investments by American corporations is recommended in a report by the Chamber of Commerce of the United States. Prepared by the Stanford Research Institute, in cooperation with the chamber's Foreign Commerce Department, the report suggests a number of tax reductions designed to increase American investments abroad, and thus reduce the burden of foreign economic aid.

The report points out that despite this government's expenditure of $38,000,000,000 for foreign aid since 1945, there still is "urgent need" for development of the economies of free nations. The suggestion is made that it is to the "best interests of the United States to foster measures that will bolster the economies of the nations over the long period."

For years, mine operators and organizations have advocated tax incentives as a means of attracting venture capital to "bolster the economies" of the western mining states. The Chamber of Commerce report is one more straw in the wind to indicate the depth to which internationalism has penetrated our national thinking.

• *Titanium Is Receiving Attention*

One good result of the Malone subcommittee hearings is the appointment by ODM Director Flemming of an industry committee to formulate plans to accelerate titanium production. This important metal of the future was receiving scant attention from ODM until the facts were given nation-wide publicity through the Malone hearings. The present production goal is 25,000 tons per year, but this amount is expected to be increased after the Flemming committee reports.

COMING CONVENTIONS

March 7 through 10, 22nd annual meeting of the PROSPECTORS AND DEVELOPERS ASSOCIATION, Royal York Hotel, Toronto, Ontario.

April 29, 30 and May 1, 1954. PACIFIC NORTHWEST METALS AND MINERAL CONFERENCE, Multnomah Hotel, Portland, Oregon.

May 24 through 27, 1954. The first SYMPOSIUM ON INSTRUMENTATION for makers and users of instruments for industrial hygiene. University of Michigan Institute of Industrial Health, Ann Arbor, Michigan.

October 5 through 9, 1954. Annual fall meeting INDUSTRIAL MINERALS DIVISION AIME, Lake Placid, New York.

THE NEW CATERPILLAR D8 TRACTOR

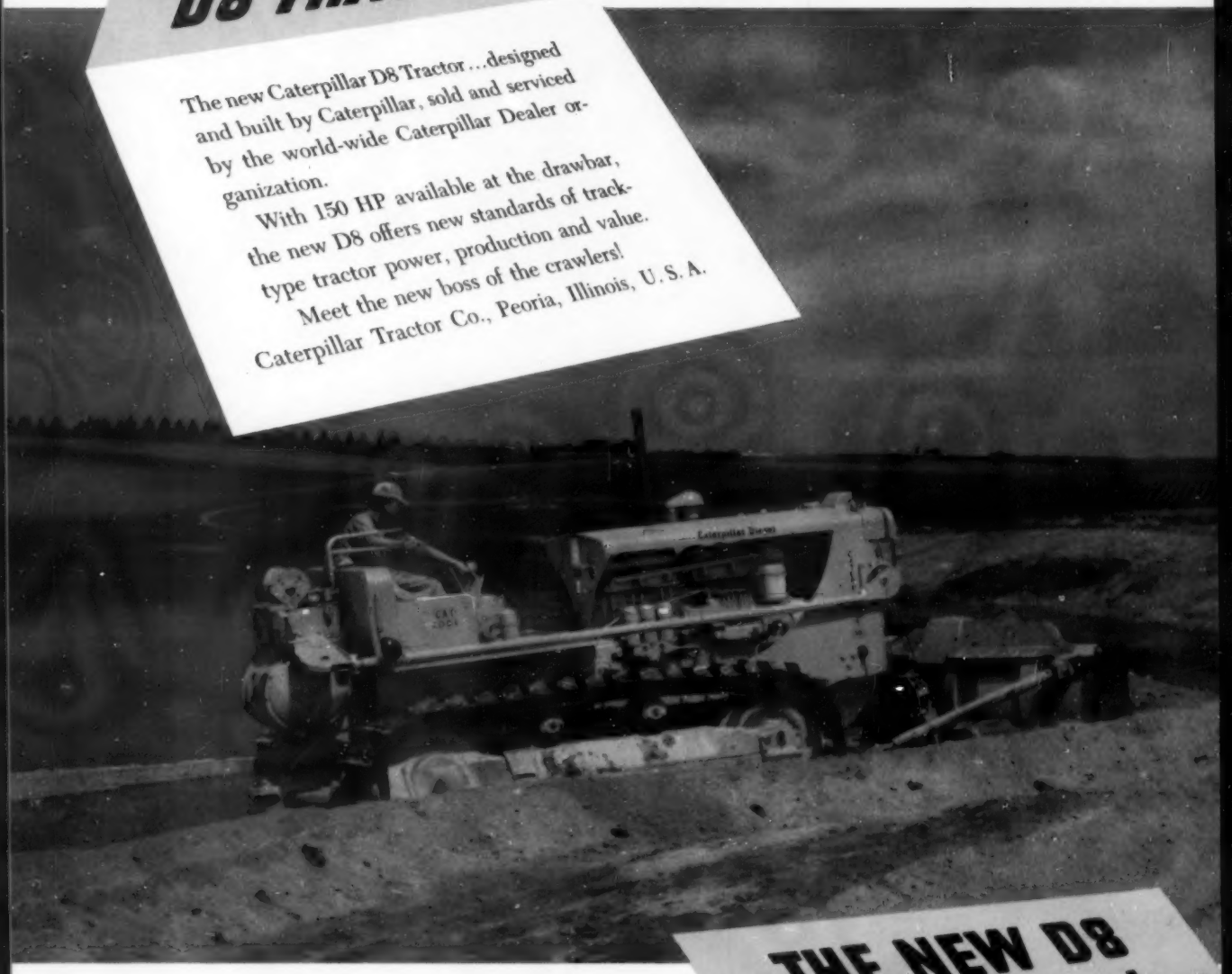
More Power... More Profit... More Production...

The new Caterpillar D8 Tractor...designed and built by Caterpillar, sold and serviced by the world-wide Caterpillar Dealer organization.

With 150 HP available at the drawbar, the new D8 offers new standards of track-type tractor power, production and value.

Meet the new boss of the crawlers!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.



THE NEW D8 Boss of the Crawlers

- The new D8 has more drawbar horsepower...horsepower that works for you.
- The new D8 is compact...it retains the maneuverability needed in tractor applications.
- The new D8 is versatile...matched to Caterpillar-designed Bulldozers, Scrapers, Rippers and Pipe Layers.
- The new D8 is also a pusher...available attachments make this machine a powerful push tractor.

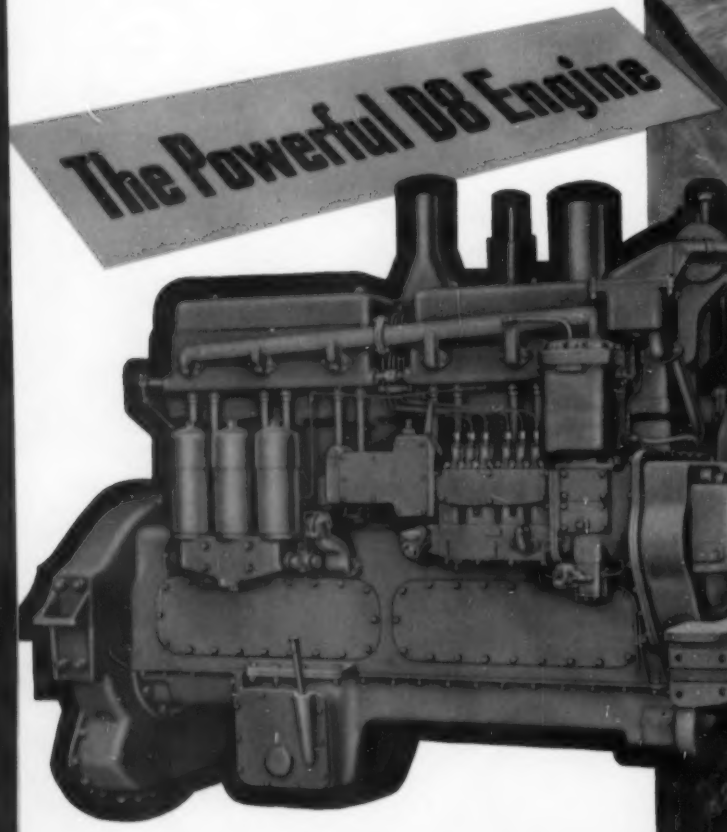
CATERPILLAR

REGISTERED TRADE MARK ®

150 Drawbar Horsepower Provided by Caterpillar D8 Engine

The new high performance of the Caterpillar D8 Tractor stems from the 185 HP, 1200 RPM diesel engine. Important new features, built into the time-tested and job-proved Caterpillar design, contribute to longer engine life and decreased operating costs as well as higher power. Some of these features are: new cylinder head incorporating valve rotators and hardened valve seat inserts, new camshaft, aluminum alloy pistons with stainless steel heat plug in the high temperature zone and a cast-in iron band for the top piston ring groove. A larger oil pump driven from the front of the crankshaft has an exclusive throttling valve pressure control which assures correct lubrication for all moving parts from the first turn of the crankshaft.

This powerful engine, with these and many other advanced features, is one of the big reasons why the D8 gives you more value than ever before.



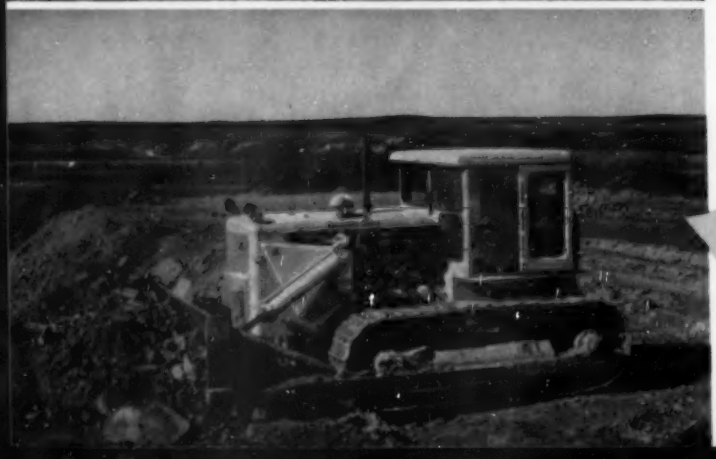
The Oil Clutch

Exclusive with Caterpillar Profitable to You...

Only Caterpillar offers you the long life and low maintenance cost of the oil clutch. The outstanding feature of this advanced clutch is that oil films absorb the friction and heat. The metallic friction surfaces do not come into contact until the last revolution or two before engagement. The clutch has its own lubrication system with gear-type pump and suction screen. The pump supplies oil under pressure to the hydraulic booster, which makes the clutch exceptionally easy to operate. Oil is also delivered to the inner diameter of the three clutch plates. This continual lubrication and cooling is the principal reason for much longer periods between adjustment and replacement than is possible with the conventional dry clutch. The oil clutch is another big reason why the D8 is a better buy.

THE NEW D8 GIVES YOU...

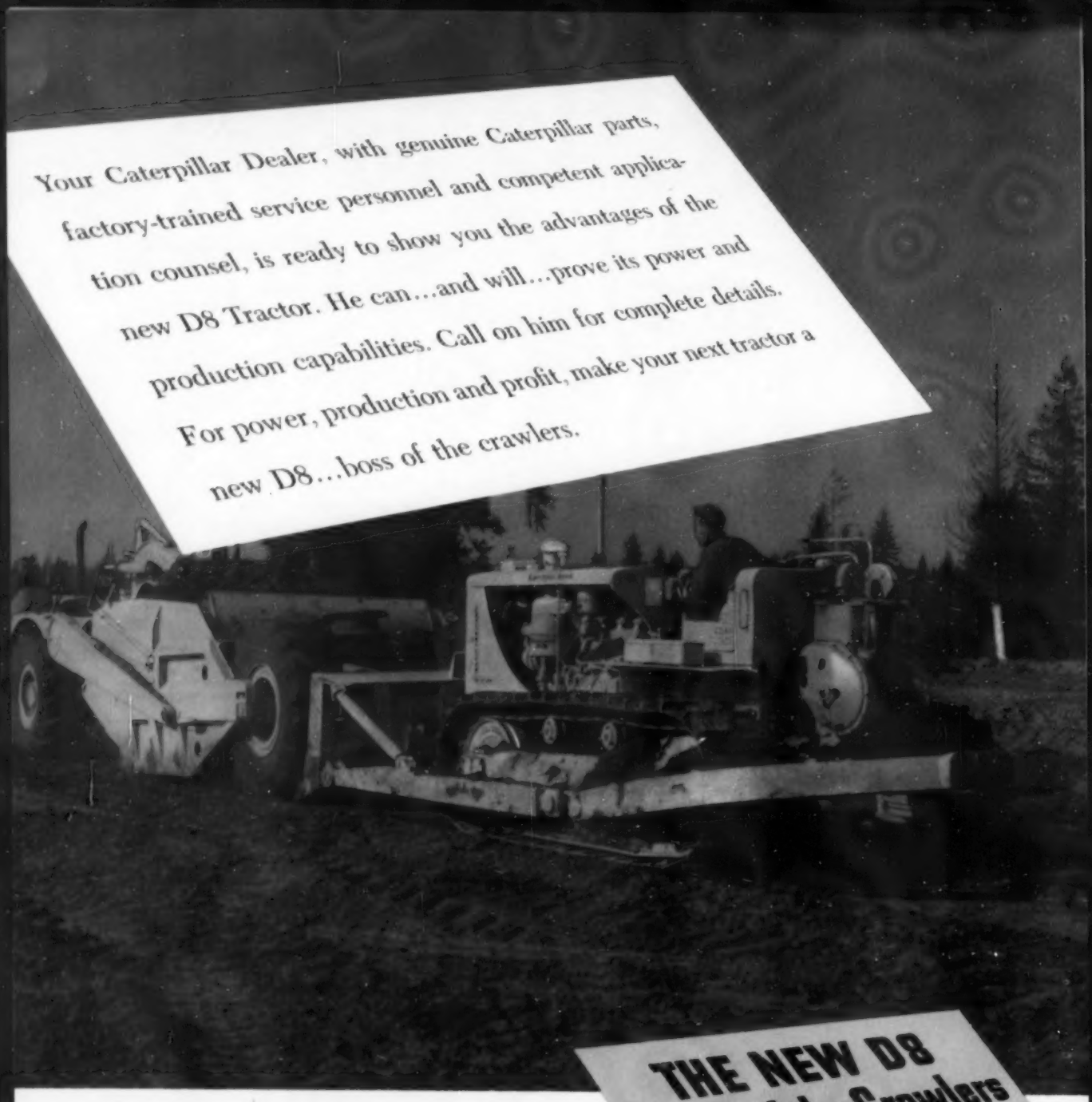
- **150 Drawbar Horsepower**
- **New Long Life Engine Features**
- **Exclusive Oil Clutch**
- **Flywheel Clutch Booster**
- **New High-Strength Frame**
- **"Hi-Electro" hardened track grouser tips**
- **Self-energizing Steering Clutches**
- **New, Large Air Cleaner**
- **Weight 38,155 lbs. (shipping weight)**
- **Compact Fuel Injection Equipment**
- **Double Universal Joint to Protect Clutch and Transmission Bearings**



Caterpillar

REGISTERED TRADE MARK ®

THE NEW D8 Boss of the Crawlers


Your Caterpillar Dealer, with genuine Caterpillar parts, factory-trained service personnel and competent application counsel, is ready to show you the advantages of the new D8 Tractor. He can...and will...prove its power and production capabilities. Call on him for complete details. For power, production and profit, make your next tractor a new D8...boss of the crawlers.

THE NEW D8
Boss of the Crawlers

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

The new Caterpillar D8 Tractor offers new highs in earthmoving production in push-tractor operations. The D8, equipped with No. 8S Bulldozer, heavy duty track roller guards, crankcase guard and tandem pusher frame, will cut your work cycles to a minimum.

Fast and maneuverable, the D8 applies a full 150 HP to the job of loading your hauling units in new record times. Push-loading, singly or in tandem, is provided to meet the conditions of your job.

PRINTED IN U.S.A.

Mining World

THE IMPORTANT MINING MAGAZINE EVERYWHERE

March, 1954

INTERNATIONAL PANORAMA

PORT COLBORNE, ONTARIO—Falconbridge Nickel Mines, Ltd. will build a nickel refinery here to treat nickel-bearing pyrrhotite concentrates using a method now being developed.

COBALT, IDAHO—Calera Mining Company and DMEA have signed a $407,340 cobalt-copper exploration contract in the vicinity of Calera's Blackbird mine here.

TOMBSTONE, ARIZONA—Newmont Exploration, Ltd. has been dewatering the Westside shaft of the Tombstone Development Company since the first of the year.

KALGOORLIE, WESTERN AUSTRALIA—Gold production in 1953 was over 1,000,000 ounces for the first time since 1942.

FORT VICTORIA, SOUTHERN RHODESIA—Two United States firms —American Potash and Chemical Corporation and American Metal Company Ltd.—are associated with Bikita Minerals Ltd. which has acquired beryl-lepidolite-petalite claims here.

MOAB, UTAH—The Homestake Mining Company has a purchase option on the uranium claims of the Little Beaver Mining Company, Inc. in the Big Indian Canyon district.

KIRKLAND LAKE, ONTARIO—A new North American depth record for mining has been set by Lake Shore Mines, Limited—8,175 feet at the bottom of its No. 4 Internal Shaft.

WASHINGTON, D. C.—E. I. DuPont de Nemours & Company and the federal government have reached an agreement whereby DuPont will design and build a new titanium metal plant with an annual capacity of 8,000 tons of titanium sponge.

KUALA LUMPUR, MALAYA—Tin miners in the Federation have voted in favor of the International Tin Agreement. The vote was 68.3 percent in favor.

BATHURST, NEW BRUNSWICK—A 100-ton pilot mill will be erected at the Austen Brook mine of the Brunswick Mining and Smelting Corporation where 1953 exploration indicated 18,990,392 tons of ore averaging 5.23 percent zinc, 1.79 lead, 0.3 copper, and 1.74 ounces silver per ton. Plans call for a 5,000-ton daily mill to start in several years.

LOURENCO MARQUES, MOZAMBIQUE—Union Carbide and Carbon Corporation has made an airborne scintillation survey and applied for a government concession covering most of Mozambique's coastal area.

MELBOURNE, AUSTRALIA—Northwest Tantalum Ltd, has signed a sales contract for rare mineral sales to the United States government.

PARAMARIBO, SURINAM—Kennecott Copper Corporation's subsidiary, Guiana Exploration Company, has been granted bauxite prospecting licenses over a large part of the coastal area.

SALT LAKE CITY, UTAH—The big three copper producers—Kennecott Copper Corporation, Anaconda Copper Mining Company, and Phelps-Dodge Corporation—have cut copper output by about 14, 10, and 6 percent, respectively. Cuts were made by shortening of the work week.

SOLON, OHIO—The Zirconium Corporation of America has started its new plant here to recover pure zirconium oxide. It is the nation's third producer.

KELLOGG, IDAHO—Six Coeur d'Alene lead-zinc-silver companies have joined forces for a Utah uranium operation. They are: Coeur d'Alene Silver Giant, Inc.; Caledonia Silver Lead Mining Company; New Era Mines; Signal Mining Company Silver Bowl, Inc; and Nancy Lee Mines, Inc.

DULUTH, MINNESOTA—United States iron ore production reached an all-time high of 119,200,000, gross tons in 1953.

MOSCOW RUSSIA—Steel production in the Soviet Union was 38,000,000 tons in 1953. This was an increase of 3,500,000 tons over 1952 output.

Exploration Firm Drills For Arkansas Diamonds

Exploration drilling is being undertaken by Geological Exploration Company, Inc., in Arkansas. A 1500 Failing portable drill is used to sample certain sections of the diamond-bearing kimberlite pipe to determine whether previously reported values per ton can be checked.

The holes will be drilled with auger bits of 14 to 16 inches diameter and spaced on a 10-foot grid system, in order to obtain a sample-to-ore ratio of 1-to-100. The holes will be drilled sufficiently deep to encounter the hard "blue ground." Drill cuttings will be treated with a heavy media separation unit, an improved type of grease table now being use at the Premier mine in South Africa, and later by electro-static methods of recovery. The flowsheet will follow closely that of the Premier mine which is owned by Premier (Transvaal) Diamond Mining Company Ltd.

Kennecott Forms Company To Prospect in Surinam

A local company, Guiana Exploration Company, has been formed by Kennecott Copper Corporation to take over its prospecting activities in Surinam. The new firm will explore along the entire coastal area (which runs from east to west), and particularly near the Marowijne, Commewijne, Coppename, Tibiti, Nickerie, and Corantijne Rivers.

Kennecott has completed prospecting on bauxite concessions held by the Netherlands Guiana Exploitation Company, Ltd. This area covered about 21,000 acres located just south of the large Moengo mine operated by the Surinam Bauxite Company, Ltd.

U. S. Tin Finds Higher Grade Ore in Crosscut

Flotation cells are being installed by United States Tin Corporation in its 100-ton gravity concentration mill at Lost River near Cape Prince of Wales, Alaska.

The tailing thickener has not yet been set up for water reclamation. Water must be pumped through the 9,000-foot water pipe and pumping system which are currently supplying 300 gallons per minute to the mill. To prevent the water line from freezing, four electric heating cables are wrapped around the pipe which is insulated with rock wool.

In the 32 crosscut south on the 365 level which intersects the granite cupola southwest of the main shaft, the firm has discovered higher grade ore than had been indicated by surface drilling. The use of the shrinkage stoping method of mining with draw holes at the lower level is working satisfactorily in the Cassiterite Dike ore body.

Stopes under 30°: Atlas Diesel rock drills. Air legs will do at least 95 percent of stope drilling in Mascot mines, including stopes less than 12 feet thick.

Stopes over 30°: Joy jackhammer with drifter shell in a "flying column mount." Column mounts will do less than 5 percent of drilling when mines fully mechanized.

Are Your Drilling Costs Too High?

They were at American Zinc Company of Tennessee But it has found and is finding these answers:

About two years ago, American Zinc Company of Tennessee set out to answer this question: "What combination of drilling equipment, in each working place we have, will give us the best results?"

Today, the company is near to its answer. New methods of drilling are saving roughly $0.10 per ton of ore mined. And since the company produces about 1,000,000 tons of ore annually, the drilling improvements mean a saving of about $100,000 annually.

In the biggest single phase of drilling—stoping in fairly thick, flat-bedded deposits—the company has changed its technique completely. Stope drillers formerly operated column-mounted 2⅝-inch jackhammers equipped with threaded steel and bits. Now, they use air-leg drills and integral (tungsten-carbide tipped) drill steel. This change alone has cut total bit-and-steel cost from $0.045 per foot to less than $0.025; more importantly, it has boosted the output index from 10 tons per man shift to 12 (based on total underground manpower including supervisory help).

Cost is still going down; and output is climbing.

The entire supervisory group at Mascot has been in charge of finding the answer to the big question: How can we minimize drilling costs? "Today," according to superintendent of mines M. J. Langley, "we are seeing the results of our work in substantially lowered direct costs, and also in a number of intangible ways. We still haven't converted completely to our proven techniques. When we are using air leg drills in all places where they should be used, we will probably have tons per man shift up to about 14; and the new techniques we are trying promise to increase efficiency still more."

One promising technique now on trial is local manufacture of integral steel. The company is using, and perfecting, a system suggested by Kennametal, Inc., of Latrobe, Pennsylvania; it is called "The KennaSet Method." Briefly, it is a simple system of manufacturing integral steel at the mine from drill-steel stock and carbide inserts. Until September 1953, American Zinc used carbon-steel drill stock. It yielded costs comparable with the best, but experience with it has shown that carbon-steel will usually fail before the insert is worn out. In recent results alloy drill rod use has resulted in lowest costs to date.

Uniform Rock

In the Mascot District, American Zinc has the first necessary condition for overall drilling tests—uniformity of rock. The mining zone is

in a dolomitic limestone of the Kingsport formation in the Knox dolomite. It's a hard fine-grained limestone dolomite which may be mineralized, or may not. But from a diller's point of view, it makes little difference whether it is ore or waste; they are uniformly drillable. The rock has been fractured, but recemented with sphalerite, dolomite, and calcite so that it is firm and unravelly unlike the waste.

There are, however, a variety of other physical conditions—each of which may call for a special type of drilling: The ore beds vary in height from 6 feet to well over 100 feet in places. Dip varies from nearly horizontal to nearly vertical.

Intensive Testing

In making tests, the management group used intensive teaching and testing as the first stage. Whether it was bits, steel, or machines that were under test, the supervisors kept a close, complete record of equipment cost per foot, labor cost, drilling speed. At the same time, they looked for improvements in method—possible better ways or equipment for doing the same job.

Following the testing stage, they broadened the scale of experiments. For drilling machines, this has meant a daily record, filled out by the foreman, for each working place, machine, and man. It gives footage of holes, and feet of advance (which is convertible to tonnage produced). The company then compiles these daily reports into a monthly record.

To get broad results on bits and steel, the company is using threaded bits in three mines, single-use bits in another, and KennaSet steel in another. On its air leg drills, it is

Eugene Martin, assistant foreman of No. 2 mine, and Atlas Diesel drill.

trying KennaSet versus purchased ⅞-inch intraset on a mine-for-mine basis.

These have been the major resulting changes: Air leg drills have replaced the old "flying column mount" for better than 95 percent of all stoping. Older 3½-inch drifters are being replaced with 3-inch drifters for track-type drifting and for trackless mining. In new operations where flat dip permits trackless mining, rubber-tired drill rigs give better costs than any other method. Carbide cutting edges have proved better than threaded multi-use or single-use steel bits. And the best bit-and-steel costs have come from light-weight, high-alloy integral-steel. Hole size has been reduced from an average of 2 inches to about 1½ inches.

Room and Pillar

American Zinc uses a heading-and-bench system of mining. Pillars 15 feet in diameter are left on 40-foot centers in a triangular pattern. Miners drive up-dip at about 25° (starting steeper than the dip of the bed), then stope along the back for 200 feet. They return to the base, take a second slice of 8 to 10 feet, and so on until they have stoped the entire thickness of the bed.

Dip at the various mines is as follows: No. 2 mine (Mascot) 21°, Grasselli mine 11°, North Friends Station 7°, Athletic mine 6°. (These are average dips, subject to a fairly wide variation.)

Today, American Zinc has divided its drilling jobs into four classifications: For 95 percent of its stoping (in stopes of under 30° dip and in all stopes under 12 feet in thickness), airleg drills have proven the best answer to date. In stopes where dip is over 30° and where beds are thicker than 12 feet, the "flying column mount" has been retained for reasons of safety. For trackless mining (as in North Friends Station and perhaps the new Young mine) the rubber-tired Drillmobile is the answer. For drifting in mines where track haulage is used, the drill jumbo wins out.

Flat Stopes—Air Legs

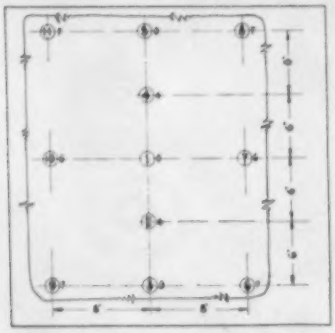
For stopes which dip less than 30° and for all stopes under 12 feet in thickness, the Atlas Diesel 754 rock drill has given the lowest costs. It is light, fast rotating. Equipped with the most suitable steel in 3, 5, 7 and

Drifts with track: Two machine jumbo with Joy drifters, Hydro drill jibs with a shell which allows use of an 8-foot steel to drill 7-foot holes.

Trackless mining: Rubber tired Joy Drillmobile with two Hydro drill jibs, Joy drifters, and 12-foot steel for drilling to 10 feet.

In Large and Small Headings This 16 by 24 Inch Burn-Cut Assures Maximum Footage Every Round

W. C. Armstrong, foreman of the North Friends Station mine, points to a burn cut that was shot separately. It cleans itself out leaving a deep free face for the rest of the round to break to.



Numbers inside circle indicate hole number. Numbers outside circle indicate millisecond delay. Holes 6 to 11 contain 11 sticks per hole. All detonators in bottom stick in hole.

The center part of a burn-cut round above is used in stopes, drifts and raises at American Zinc's Tennessee mines. It allows about 8½ feet of advance in 4 by 6 foot drifts (used for sublevels, manways, and drainage). It also serves as the basis for stope rounds. And it result in lower powder consumption and or better breakage.

Key to the round is the inter-working of holes Nos. 1 to 5. Fired first, holes Nos. 1, 3, and 5 are loaded heaviest (15 sticks each). Holes Nos. 2 and 4 are drilled one foot deeper, and are loaded only in that bottom foot (with three sticks each). When Nos. 1, 3, and 5 are detonated, they break toward the top, unstemmed portion of Nos. 2 and 4. Then Nos. 2 and 4, loaded only at the bottom, push broken rock out of the burn area. They clean it out in a cannon-like effect, leaving a wedge-shaped face for successive holes to break toward.

Another final result is less throw, a closer muck pile, than with previous rounds.

10-foot changes, its drilling speed is about 20 inches per minute versus 15 inches per minute for the best of two competing air leg drills.

Each machine has one operator. He drills about 8.5 holes per shift, for a total of about 80 feet per shift. With smaller holes and closer spacing, that breaks about 65 to 70 tons per machine shift.

The former column-mounts were operated by one man, drilled about 45 feet per machine shift, and resulted in 42 tons per machine shift.

Increased production from air legs comes in three ways: They penetrate faster, about 20 inches per minute versus 6 inches per minute for the column mounts. They are quicker to set up. They can be carried into the stope more quickly, by hand (men usually brought column mounts into the stope with a scraper hoist). The result is an approximate 50 percent increase in tonnage broken.

The company is also experimenting with long-hole exploratory drilling with the Atlas Diesel. Using sectional carbide-tipped steel, crews have drilled long, flat holes up to about 120 feet in depth. They drill at an angle of plus-5° to -7° at the start. Except for steel, the setup is conventional. Drillers collect sludge for their samples. Since the ore is uniform and low in grade, sludge samples give nearly the same result as core samples.

Steep Slopes—Columns

Though the column mount is not as productive, American Zinc may retain it for reasons of safety in stopes which dip over 30° and are over 12-feet in thickness. But it is working on a suitable steep-slope tailhold for air leg drills. Its reason for using the column mount is safety—the danger of men falling off a bench if they shank a steel or let the machine get out of control.

On the column-mount rigs, American Zinc Company of Tennessee is using up its stock of detachable bits and steel. By January of 1954, it will have replaced all but the steep-slope rigs with air leg drills.

The "flying column mount" at Mascot is a fairly light setup. It is a column for thick stopes. It consists of a 6-foot-high post with cross bar. The driller puts a 3-foot starter on the floor about six inches deep, slips the column over this starter, braces it at the top with a powder stick or pipe, and braces his crossbar to a wall. His machine is a Joy L-57 jackhammer on a drifter mounting.

Track Drifts—Jumbos

For track drifts, American Zinc has found that drill jumbos are the most productive. They are equipped with two Joy hydro drill jibs. Formerly, the company used 3½-inch drifters (Joy T-350s), but 3-inch drifters (Joy T-300s) drilled faster. Drillers use an 8-foot steel which allows for a drilled depth of 7 feet. Usual drift size is 9 by 9 feet.

Drifting crews have followed the same transition in steel as stoping crews. Starting with conventional threaded steel bits, they have ended with integral steel, now KennaSet.

Each two-man crew uses an Eimco 21 loader, a shop-made jumbo for 24-inch gauge track, and four 4-ton cars. They normally work on a round-in, roundout basis—one shift per day. They drive a 9 by 9-foot drift, drilling to 7 feet with an 8-foot steel and getting an advance of about 6 feet per shift. Each crew drills an average of 154 feet per day, for an average of 77 feet per machine shift. Roughly 45 percent of each shift is spent in drilling, and 55 percent in mucking out and blasting. No timbering is necessary.

Trackless Mining

American Zinc uses its most productive drilling method at its newest mine, North Friends Station. There the company is using three rubber-tired Joy Drillmobiles. Each is equipped with two Hydro Drill Jibs, mounting Joy T-300 (3-inch)

Harry Miller, (and son Jack) assistant superintendent of mines in Knox County advocates drilling small holes.

drifters. Each has two LW6 shells which allow for use of a 120-inch steel. The steel is one-inch hexagonal intraset steel with 1-⅝-inch carbide tip.

On the Drillmobiles, the drifters penetrate at an average rate of 13 inches per minute. That results in production of about 110 to 120 feet of hole per machine shift. This drilling efficiency, combined with loading and hauling efficiency, results in 30 tons per manshift (All labor, including supervision).

On new Drillmobiles (and possibly by alteration of existing ones), the company is planning to mount three Hydro Drill Jibs.

Drillmobile in North Friends Station mine. Upper machine (left) drills a breast hole while machine at right is drilling a lifter.

Bits and Steel

Before the drilling tests, American Zinc was using 2⅛-inch Amertiple-use threaded steel bits on 1¼-inch hexagonal steel. Average rate of penetration was about 6½ inches per minute (and speed of penetration is an important factor in tons per machine shift), for an overall bit and steel cost of about $0.045 per foot.

With single-use bits, the rate of penetration was about the same, and bit and steel cost fell to about $0.04 per foot.

Since the first of 1953, American Zinc has used Coronant ⅞-inch high-alloy carbide-tipped steel in about 75 percent of its stopes. It has given the best costs to date, about $0.0225 per foot, and has given a high rate of penetration with the various machines. Average life per steel has been 1,066 feet.

Also early in 1952, the company started to manufacture its own intraset steel locally. It is using the KennaSet method.

Lower Costs—More Pay

Nearly all miners work on a base and bonus system. A driller, for instance, gets a base rate of pay with a bonus for each ton he produces. Today, producing more tons of ore per shift, he works under the same bonus, and has raised his average pay by about 10 percent. (In the meantime, a general raise has boosted his pay by another 10 percent.)

Other workmen—scraper operators and motormen—have also benefited from increased output per stope. With greater tonnage from each working place, these men have less moving or traveling to do during a shift. Result: Their pay has gone up on about the same scale.

For the company, it has meant a decrease in mining costs of about $0.10 per ton.

Air Leg Knowhow

The air leg drill has been a key to much of the increase in production, but after a first trial, the company almost gave up on air legs. The company bought one separate leg, mounted a 2-⅝-inch jackhammer on it, and equipped it with 1¼-inch steel. Miners were not familiar with it, and using this heavy drill, they turned in strongly negative reports and results.

About that time, Harry Miller came to work at Mascot. He had worked with air legs in Colorado, knew how to run them, and talked management into buying one complete air leg-and-drill unit. Then he taught two miners how to operate it (equipped this time with ⅞-inch intraset steel). The result was a surprising increase in production.

Since then, Mr. Miller has been a key man in the entire drilling study. Looking into the future, he says: "We will go to smaller drills and smaller sticks of powder. Perhaps in very small holes, the powder should be a fluid squirted in with a machine similar to a grease gun. Much of the future of rock drilling seems to be in the hands of the steel and powder manufacturers."

H. A. Coy, General Superintendent, brings the past into perspective when he says: "We have studied the art of rock drilling for many years. We were the second operation in the United States (following Butte) to go 100 percent to detachable bits." Then, reaching into his desk and laying a bit on the top: "Hawkesworth gave me this when he was first testing detachable bits. It's very similar to the recent single-use bit."

In this stope in American Zinc's No. 2 mine a Joy L-57 machine is set up on a "flying column mount."

LEFT: Pioneer 42-by 48-inch, overhead-eccentric, all steel frame, jaw crusher which is used on the scalping screen oversize. RIGHT: Two 5- by 20-foot Simplicity double-deck screens, designed to minimize the depth of the material on the screen thereby reducing media losses. Left, "float" screen, right, "sink."

New West Hill Plant Points Way To

Western Mining Company is now milling Mesabi Range iron formations that would not be economically feasible to mine if it were not for the new metallurgical features it has incorporated in its West Hill plant. This plant is located on the western end of the Mesabi Range between Coleraine and Grand Rapids, Minnesota. It is a combination wash and heavy-media type with a capacity of 750 tons per hour. Media consumption lower than or equal to that of any other Iron Range plant is maintained by several newly designed features.[1] The use of a large number of conveyors makes the flowsheet very flexible with the result that any grade of material mined in the pit can be easily milled with the least amount of handling. Other added features make for more efficient operation and result in lower overall milling costs.

Engineering design and construction to the flowsheet specifications were by the Western-Knapp Engineering Company under contract with Western Mining Company. Pickands Mather & Co. is the operating agent for Western Mining.

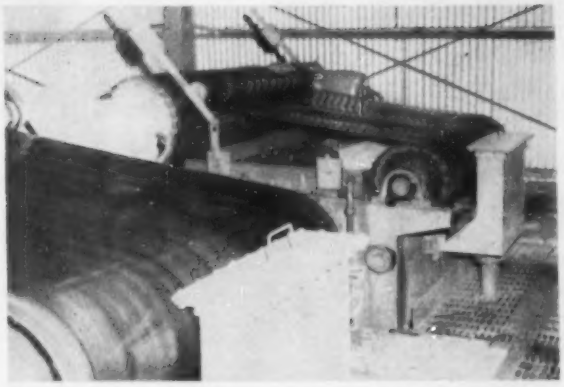
F. D. DeVaney, chief metallurgist, E. C. Herkenhoff, metallurgist, and Harry G. Gerber, general plant foreman, of Pickands Mather & Co. used their knowledge gained in past experiences and laboratory experiments to design the flowsheet. Mine and mill operations are under the supervision of E. J. Fearing, general superintendent Mesabi Range, Pickands Mather & Co., and L. M. Becker, mine superintendent, Western Mining Company. Milling is directed by George Paul, general mill foreman, with the assistance of George Bibich, shift plant foreman, and Lawrence Dimatteo, plant clerk.

Three different concentrates are produced or will be produced as follows: a wash-concentrate, an HMS concentrate, and a cyclone concentrate. During the 1953 season, only the first two concentrates were produced and the feed for the cyclone plant was stockpiled for treatment in 1954. This plant incorporates seven newly designed features used for the first time on Mesabi Range ore:

(1) In the pit screening plant a speed-up belt, taking the scalping screen undersize, delivers the minus-4½-inch ore to the main pit belt at practically the same speed of travel as the main belt. This minimizes loading impact and wear on the expensive, long pit belt.

(2) The main wash plant was designed and built to minimum height. As a result, the head pulley of the belt delivering crude ore to the washing sections is only 42½ feet above the ground level. The Symons crusher foundations are at ground

[1] Average plant media loss is between 0.75 and 1.0 pound per ton of feed to the heavy media section—Ed.



LEFT: Dings 48-inch magnetic separators. Two of these are used in the primary position to recover the ferrosilicon. RIGHT: The speed-up belt in the pit screening plant, taking the scalping screen undersize, delivers the minus-4½-inch ore to the main pit belt at practically the same speed of travel as the main pit belt.

Mining Of Leaner Mesabi Iron Ores

level, minimizing the supporting steel requirements and building vibration.

(3) The Wemco 84-inch-diameter spiral classifiers were the largest ever constructed for classification purposes.

(4) The heavy-media wash and drain screens are double deck (all other Iron Range HMS plants use single-deck screens). They are designed to minimize the depth of material on the screen surface, to which medium attachment losses usually are directly proportional.

(5) The wash water on the heavy-media screens is applied in counter-flow principle, giving double washing without employing excessive volumes of wash water.

(6) A Dings permanent magnet (Alnico) drum-type separator, 24 inches in diameter by 72 inches in length, is used as a secondary magnetic separator to provide protection against media losses caused by power failures.

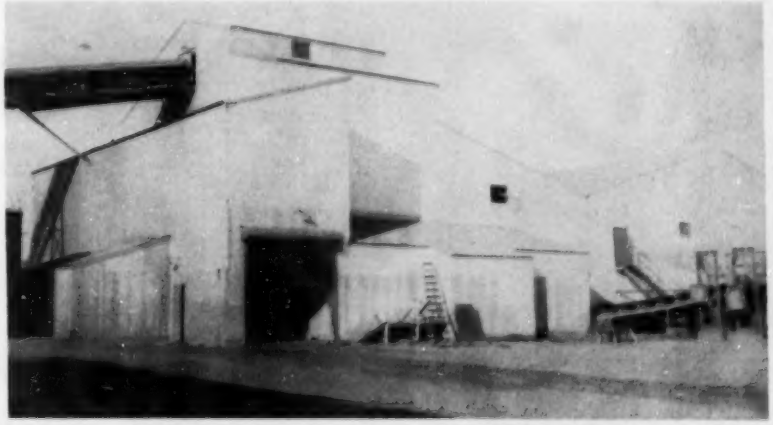
(7) Scrubbing or puddling troughs were designed and built into the vibrating screens, both in the washing and heavy-media sections, to obtain better washing and to lower medium attachment losses. Other Iron Range plants are now following this practice, particularly in heavy-media sections.

Pit Screening Plant

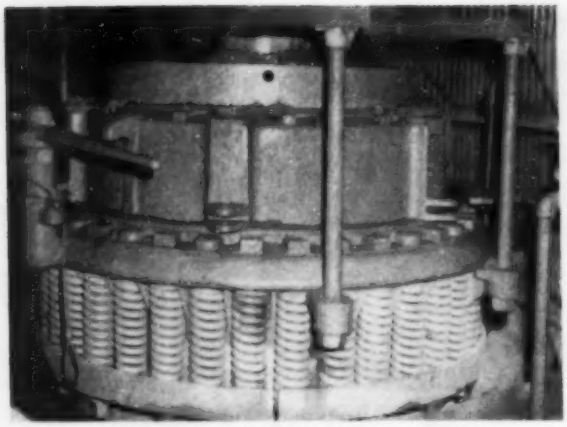
Crude ore from mining faces analyzing from 35 to 48 per cent iron is hauled by Diesel trucks and dumped into a steel surge bin from which a 5- by 17-foot Bathke pan feeder delivers it to a 6- by 12-foot Tyler scalping screen. The undersize, minus-4-inches, discharges onto a 36-inch by 10-foot speed-up belt (all other conveyor belts are 30 inches in width). Ore from this belt drops onto 1040-foot-long main conveyor belt. The screen oversize, plus-4-inch, drops into a 42- by 48-inch Pioneer jaw crusher. The crushed ore joins the undersize on the main conveyor, or, if it is considered to be of such low grade as not to be worth milling, it is discharged onto a 125-foot conveyor leading to a 200-ton steel bin. Trucks haul waste to the dump. Ore traveling on the main conveyor is weighed with a Merrick Weightometer before it arrives at the washing plant.

Washing Plant

The main conveyor discharges onto a splitter which separates the ore stream in two equal parts, each half going to one of two identical washing circuits. From the splitter, ore drops onto a 5- by 12-foot Allis Chalmers double-deck screen. Screen oversize, plus-1¼-inches, falls to a 4-foot Nordberg Symons cone crusher set at one inch. Crusher ore drops to a 4- by 8-foot Allis Chalmers double-deck screen. Over-



Left side of the building contains the washing plant; right side houses the HMS section. Conveyor at left brings crude ore from pit.



LEFT: Wemco drum separator discharging onto the "float" and "sink" screen. Trough on the left leads to the "float" screen; one on right discharges to the "sink" screen. Screens use wash water applied in counter-flow principle. RIGHT: One of the 4-foot Nordberg Symons cone crushers used for plus-1¼-inch ore.

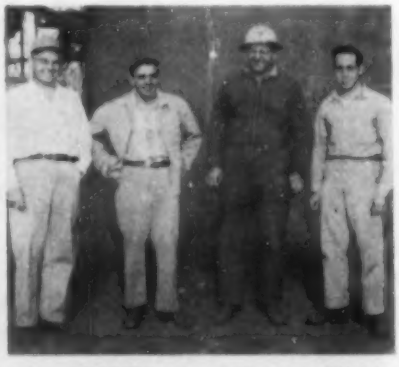
size from the 4-by 8-foot screen, plus-⅛-inch, falls to a 43-foot conveyor which transfers the ore to one of two conveyors depending upon the grade, of the material. If high enough in grade, it is directed to a conveyor leading to railroad cars, if not of shipping grade it is directed to the other conveyor which leads to the HMS plant. Undersize from the 4- by 8-foot screen is pumped with a Denver SRL pump to an 84-inch Wemco washing classifier. Classifier underflow, depending on grade, is directed to either the conveyor leading to railroad cars for direct shipment as a wash concentrate, or to a 205-foot conveyor which discharges into a 200-ton steel bin. From this "lean" fine material is trucked to a near-by stockpile to be subsequently treated in the cyclone plant now under construction. Classifier overflow, minus-65-mesh, is tailing and is pumped into the tailing pond.

Undersize from the primary washing screen falls to a 5- by 14-foot Simplicity double-deck screen. Oversize from this screen, plus-¼-inch, drops on a 21-foot conveyor. If this material is of sufficient grade, it is directed from this conveyor to the wash concentrate conveyor. If not of high enough grade, the ore is transferred to the HMS plant conveyor for further treatment. Undersize from the 5- by 14-foot screen drops to the washing classifier. Ore which is fed to the 100-foot wash concentrate conveyor is weighed with a Conveyoflo-Meter and then discharged to one of two additional conveyors. Ordinarily railroad cars are available and the wash concentrate is fed to a 103-foot conveyor which drops it into a 100-ton steel bin from which it is loaded into railroad cars for transportation to the ore docks and blast furnaces. If railroad cars are not available for immediate loading, the concentrate is directed to another conveyor 176 feet in length and at right angles to the adjacent one which carries it to a 200-ton steel bin. From there it is trucked to a stockpile.

HMS Plant

Ore from the wash plant to be sent to the HMS plant is dropped onto a 185-foot conveyor; this, in turn, transfers it to a 72-foot swinging stockpile conveyor. Beneath this stockpile is a 42-inch by 6-foot 2-inch Link Belt pan feeder that feeds a 141-foot conveyor. Ore on this conveyor is weighed with a Merrick Weightometer and discharged on a 5- by 16-foot Simplicity double-deck screen. Oversize, plus-⅝-inch, is fed by means of a 31-foot drum feed conveyor to and 8-by 8-foot Wemco drum separator. Undersize is pumped with a 6-inch SRL pump to the classifiers in the washing plant. Recirculated ferrosilicon media is fed into the drum separator with a 5-inch Wemco pump.

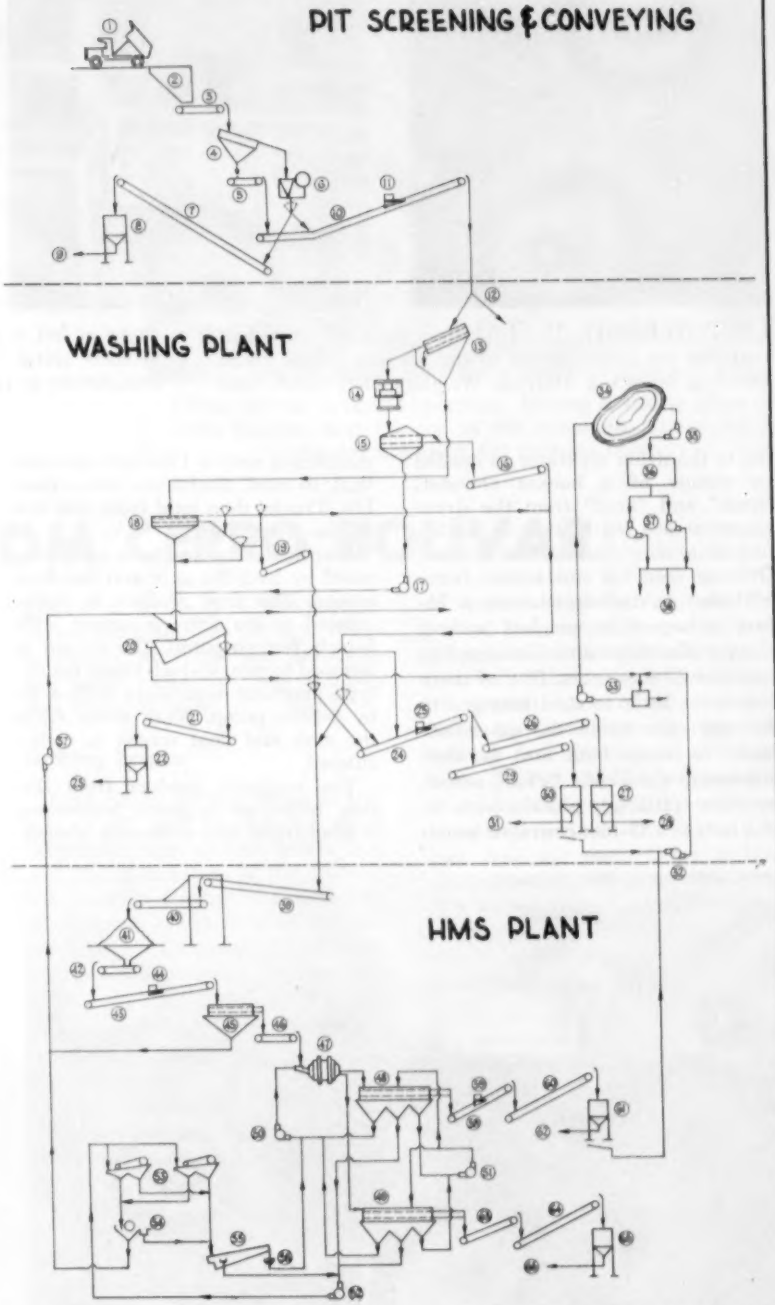
Make-up ferrosilicon to compensate for that lost in the circuit is



LEFT: F. D. DeVaney, chief metallurgist, CENTER: West Hill operating staff. From left to right: Jerry Verrant, field clerk; George Paul, general mill foreman; George Bibich, shift plant foreman, and Lawrence Dimatteo, plant clerk. RIGHT: B. C. Herkenhoff, metallurgist.

1953 Flowsheet of Western Mining Company's West Hill Plant

Coleraine, Minnesota



LEGEND

Pit Screening and Conveying

1. Ore trucks from mine.
2. Surge bin.
3. Pan feeder, Bathke, 5- by 17-foot.
4. Scalping screen, Tyler, 6- by 12-foot.
5. Speed-up belt, 36 inch by 10-foot.
6. Jaw crusher, Pioneer, 42- by 48-inch.
7. Rock reject belt, 30-inch by 125-foot.
8. Surge bin, 200 ton.
9. Trucks to waste.
10. Main pit conveyor, 30 inch by 1040 foot.
11. Merrick Weightometer.

Washing Plant

12. Splitter.
13. Primary wash screen, Allis-Chalmers, double-deck, 5 by 12 feet (2).
14. Symons cone crusher, Nordberg, 4-foot (2).
15. Crusher product Lo Head screen, Allis-Chalmers, double-deck, 4- by 8-foot (2).
16. Crusher product screen oversize conveyor, 30-inch by 43-foot (2).
17. Crusher product undersize SRL pump, Denver Equipment, 3 by 3 (2).
18. Secondary screen, Simplicity, double-deck, 5- by 14-foot (2).
19. Secondary screen oversize conveyor, 30-inch by 21-foot (2).
20. Classifier, Wemco spiral, 84-inch (2).
21. Lean fines conveyor, 30-inch by 205-foot.
22. Lean fines bin, 200 ton.
23. Trucks to lean fines stockpile.
24. Wash concentrate conveyor, 30-inch by 100-foot.
25. Conveyoflo-Meter.
26. Wash concentrate stockpile conveyor, 30-inch by 103-foot.
27. Wash concentrate stockpile loading bin, 200 ton.
28. Trucks to wash concentrate stockpile.
29. Wash concentrate bin conveyor, 30-inch by 103-foot.
30. Wash concentrate railroad loading bin, 100 ton.
31. Railroad cars.
32. Track and bin clean-up pump, Road Machinery, 3 by 3.
33. Main tailings pumps, Pettibone-Mulliken (2).
34. Tailings pond.
35. Clear water supply pump.
36. Clear water tank, 50,000 gallon.
37. Clear water pumps, Fairbanks-Morse, 25,000 gpm (2).
38. Water for plant use.

HMS Plant

39. HMS conveyor, 30-inch by 185-foot.
40. HMS stacker, 30-inch by 72-foot.
41. HMS surge pile.
42. Pan feeder, Link Belt, 42-inches by 6-feet-2-inches.
43. Feed conveyor, 30-inch by 141-foot.
44. Merrick Weightometer.
45. Feed preparation screen, Simplicity, double-deck, 5 by 16 feet.
46. Drum feed conveyor, 36-inch by 31-foot.
47. HMS drum separator, Wemco, 8- by 8-foot.
48. Sink screen, Simplicity, double-deck, 5- by 20-foot.
49. Float screen, Simplicity, double-deck, 5- by 20-foot.
50. Medium circulating pump, Wemco, 5-inch.
51. Counter flow washing pump, Denver Equipment, 6 by 6 SRL.
52. Magnetic separator feed pump, Denver Equipment, 6 by 6 SRL.
53. Magnetic separator, Dings belt-type, 48-inch (2).
54. Drum magnetic separator, Dings, 72-inch.
55. Densifier, Wemco, 48-inch.
56. Demagnitizing coil, Westinghouse, 8-inch.
57. Magnetic separator tailings pump, Road Machinery, 6 by 6.
58. HMS concentrate conveyor, 30-inch by 74-foot.
59. Conveyoflo-Meter.
60. HMS concentrate bin conveyor, 30-inch by 125-foot.
61. HMS concentrate railroad bin, 100 ton.
62. Railroad cars.
63. HMS reject conveyor, 30-inch by 72-foot.
64. HMS reject bin conveyor, 30-inch by 154-foot.
65. HMS reject loading bin, 200 ton.
66. Trucks to waste.

LEFT TO RIGHT: The 1,040-foot main conveyor belt carrying ore from the pit to the washing plant; small building houses a Merrick Weightometer; short conveyor at left is for rejected waste. One of the 84-inch Wemco spiral classifiers. Conveyors carrying coarse concentrate to railroad cars-ore ports.

fed to the drum separator as needed by means of a bucket elevator. "Sink" and "float" from the drum separator are fed to two, 5- by 20-foot Simplicity double-deck screens. Oversize from the sink screen (concentrate) is discharged onto a 74-foot conveyor, is weighed with a Conveyoflo-meter and discharged to one of two conveyors. One of these conveyors leads to steel bins and to railroad cars while the other one leads to steel bins and is then trucked to a stockpile. "Float" screen oversize (tailing) plus-⅛-inch in size falls to a 73-foot conveyor which discharges onto a 170-foot conveyor that, in turn, discharges into a steel bin. Trucks then haul from this bin to the waste dump.

Two undersize products are separated by both the sink and the float screen. The first product is recirculated to the drum separator with 5-inch Wemco pump. The second is pumped to two, 48-inch Dings drum-type magnetic separators with a 6- by 6-SRL pump. Wash water from the sink and float screen is recirculated.

The magnetic product from the two, belt-type magnetic separators is discharged into a 48-inch Wemco densifier. The non-magnetic product is fed to a 72-inch Dings drum-type Alnico magnetic separator. The magnetic product from the 72-inch separator is also fed to the densifier, while the non-magnetic product is pumped to the two classifiers in the washing plant. Underflow (ferro-silicon) from the densifier is fed to an 8-inch Westinghouse demagnitizing coil and then recirculated to the Wemco drum separator. Overflow from the densifier is recirculated to the two, 48-inch magnetic separators.

A 30-ton Dart truck dumping its load of ore into the pit screening and crushing plant. Here it is crushed and then sent to the washing plant.

Water Supply

Clear water from the tailing pond is pumped to a 50,000-gallon tank. From here, two Fairbanks Morris pumps deliver it to the different sections of the plant.

Cyclone Plant

A cyclone plant with a capacity of 160 tons per hour is now being constructed adjacent to the washing and HMS plant to treat the minus-⅛-inch lean fines material. Engineering design, and construction to the flowsheet specifications is by the Western-Knapp Engineering Company. This plant will consist of two identical sections. Each section will contain two, 14-inch DSM cyclones and primary and secondary magnetic separators with the secondary magnetic separators and dewatering classifiers built in one unit. Operation is expected to begin in May 1954.

From Venezuela to Pennsylvania

Men have labored

To mine and ship

5,000,000 annual tons of

Cerro Bolivar in actual operation. Mining is taking place on three benches near the top of the mountain. Lower left is the loading dock for railroad cars.

IRON ORE FROM CERRO BOLIVAR

The first shipload of iron ore from Cerro Bolivar, Venezuela arrived in the United States on January 19, 1954. This marks the beginning of an annual shipment of 5,000,000 tons (*later to be expanded to 10,000,000 tons*) from the Orinoco Mining Company, a subsidiary of the United States Steel Corporation. Ore from Cerro Bolivar is being shipped to U. S. Steel blast furnaces at the new Fairless Works at Morrisville, Pennsylvania and also to the Birmingham, Alabama Works.

Cerro Bolivar, the name given to the mountain of rich iron ore, is located in a remote section of eastern Venezuela. The deposit was discovered by U. S. Steel men in April 1947 after almost two years of exploration.

Aerial Photography

Dimensional aerial photography is what led to the remarkable discovery. In early 1947 a contract had been entered into with Fairchild Aerial Surveys Inc. to photograph and prepare maps covering an area of about 11,000 square miles. By correlating proven ore deposits with their appearance on aerial photographs in respect to size, shape, vegetation and other physical characteristics, attention was drawn to two small mountains; one of these was Cerro Bolivar.

Drilling Began

Exploration drilling began in October 1947 and has proved about 500,000,000 tons of high-grade iron ore. The dimensions of the orebody are roughly 4 miles in length with a maximum width of 4,000 feet and an average thickness of 230 feet; maximum thickness is 550 feet.

The ore body consists of folded beds associated with ferruginous quartzite. It occurs as a mixture of hematite, limonite and a small percentage of magnetite. Average grade (dry analysis is about 63.50 percent iron; natural iron content is about 58 percent. This is of a higher grade than the average Lake Superior iron ore. It also has the advantage of being practically free of sulphur and low in other impurities.

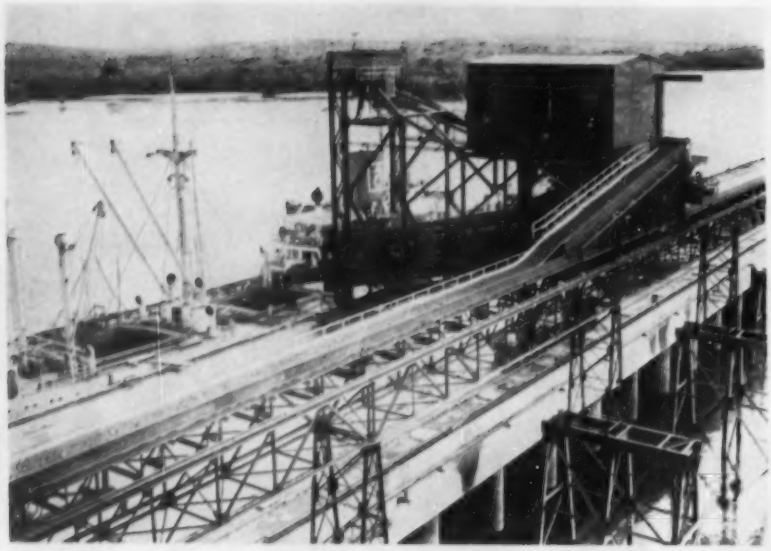
Mining Methods

The orebody is practically free of overburden and in some respects is an outer shell of the mountain. The top of the mountain and a good portion of its side slopes will be removed. All mining will be above the ground level. Initial mining is being done on three 50-foot-wide benches near the summit. For blast hole drilling 50-T Bucyrus-Erie churn drills and a 58-BH Joy Champion Rotary Drill, drilling a 7⅞-inch hole are used. Other drilling equipment, including jack hammers and wagon drills, is planned for use during the development stage. The exact spacing of holes and quantity and type of explosives to be used will be determined by further mining operations.

Broken ore is loaded with two 8-cubic-yard Bucyrus-Erie electric shovels and one 6-cubic-yard Lima Diesel shovel. One shovel operates on each bench. The capacity of these three shovels is great enough to produce the required tonnage of 5,000,000 tons per year by operating on a single shift basis.

Downhill Trucking

Sixteen 20-cubic yard LRSW Mack trucks haul the ore to two



Loading the first Cerro Bolivar iron ore on board the Swedish freighter **S. S. Tosca** at Puerto Ordaz for transportation to U. S. Steel's Fairless Works at Morrisville, Pennsylvania, a distance of 2,004 miles.

structural steel loading docks located approximately one-half mile from the working faces. Here it is loaded directly into railroad cars for haulage to the port. Trucks will haul downhill making braking action of prime importance. Truck specifications called for a vehicle which among other requirements would travel loaded, down an 8 percent grade at any speed below 20 miles per hour under the control of an auxiliary retarding device independent of the wheel brakes. Trucks selected are equipped with the Twin Disc converter retarder and the Parkersburg Hydrotarder.

Ore Trains

Ore cars constructed by Magor Car Corporation of New Jersey are four-axle, 90 long tons net load, weighing about 250,000 pounds loaded. They are equipped with standard Westinghouse air brakes with an additional straight air line that makes it possible to apply the brakes and charge the reservoirs at the same time, providing another safety factor. It was possible to use this unique method because the cars will not be interchanged. The first trains consist of 93 cars with later trains to be composed of 123 cars.

Locomotives are Baldwin-Lima-Hamilton, Diesel-electric, three-axle trucks, 180-ton, 1,600-horsepower units. Three locomotives are expected to be used on a 123-car train. Although the maximum adverse grades on the track are 0.5 percent, they are short enough so as not to govern; the ruling grade is 0.2 percent. Tracks were designed for operation at speeds of 45 miles per hour.

Twelve inches of crushed stone are used for ballast under the bottom of the ties on all main line track. The ties are mostly creosoted Southern pine or gum from the United States. Some native ties were used, but they were not used in quantity because of lack of local production, unsuitability of the wood, and the absence of facilities for creosoting. Main line rail is 132 pound and the track is of standard gauge.

Two loaded and two empty trains per day will be required for the 5,000,000 tons per year. The average round trip time from Cerro Bolivar to Puerto Ordaz (the port), a distance of 88 miles, is approximately 7 hours and 50 minutes.

A centralized traffic control system along with four long passing tracks approaches that of a double-track road. This control system is operated by radio signals, thus avoiding the construction of a costly wire line.

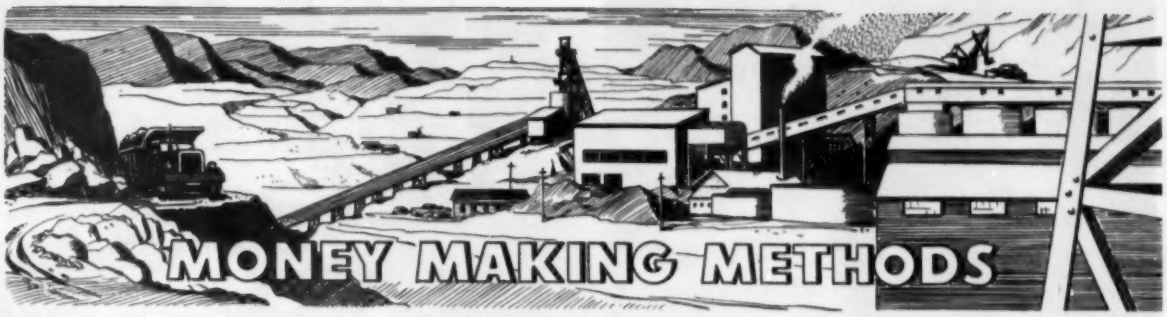
One of the most important features of the track operation will be the control of the loaded ore trains on the seven-mile, three percent downgrade from the mine. Two run-a-way tracks are provided on this section, with switches set for through track movement. If speed exceeds 21 miles per hour through an electrically timed section preceding the location of the run-a-way track, the switch is thrown. The ore train will then leave the main track and be stopped on the adverse grade of the run-a-way track.

Power Plant

A power plant consisting of two 2,500-kilowatt, Nordberg, Diesel-electric units has been constructed at the base of Cerro Bolivar. This will supply power for the townsite and the two electric shovels at the mine.

For a description of the ore handling system of Puerto Ordaz see MINING WORLD, December, 1953 (pages 50-52).

Shown on the day of the arrival of the **S. S. Tosca** are (left to right) Clifford F. Hood, president of United States Steel; Dr. Cesar Gonzales, ambassador from Venezuela, and John S. Fine, governor of Pennsylvania.



WOULD YOU LIKE TO SEE THE INSIDE OF A DRILL HOLE?

A new milestone in the progress of subsurface exploration was reached with the announcement by the Chief of Army Engineers of the development of the "NX" Bore Hole Camera. The device surpasses all other cameras for obtaining continuous undistorted cylindrical color-pictures of water-filled or dry drill holes.

To the geologist and the mining and civil engineer, this new camera signifies the end of guesswork with respect to underground conditions which have eluded identification by conventional core-drilling methods.

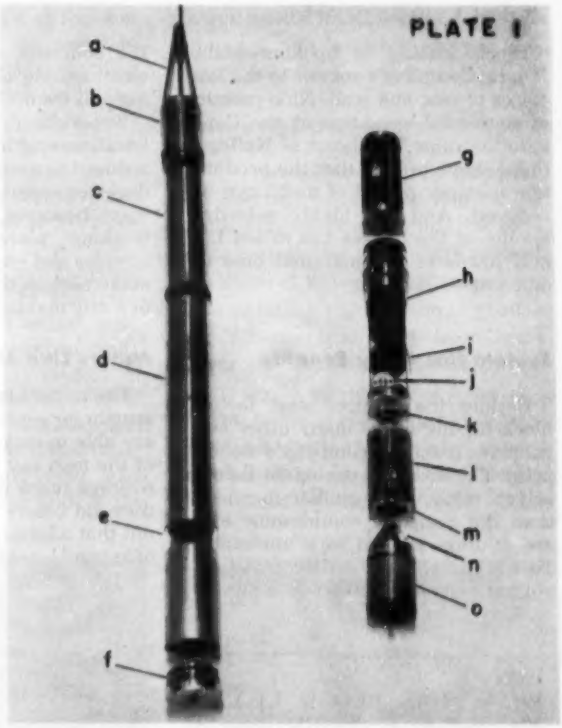
The pilot model of the camera has more than paid for itself as a result of its success in bringing to the surface information at two dams. Previously this information could be obtained only by the costly drilling of man-sized bore holes for subsurface on-the-spot examination. Now a relatively low cost "NX" (3-inch) bore hole can be drilled and the interior surface photographed completely with the Bore Hole Camera.

Research and development for the first camera and projection equipment were conducted by the Engineering Research Associates, Division of Remington Rand, Inc., under the technical supervision of, and in accordance with, plans and specifications furnished by the Geology and Geophysics Branch, Office of the Chief of Army Engineers in Washington.

Externally the camera unit is a simple stainless-steel tube 31½ inches long and 2-¾ inches in diameter, with a circular quartz window (e), located five inches above the lower end. Internally, the principal elements include an oil-damped compass (o) which supports a hollow and truncated conical mirror (n). The latter is situated inside and directly opposite the quartz window, thus comprising the "eye" of the camera. The hollow and truncated construction of the conical mirror makes the underlying compass visible to the 15-mm camera lens (k) located a short distance above the mirror. A high-voltage circular flash-tube (m), midway between the cone mirror and camera lens and actuated by a current pulsing devise on the camera lowering rig, simultaneously illuminates the boring and exposes the film to the bright mirror image. Directly above the lens is a conventional 16-mm moving-picture camera (h, i, j), with motor and spool drive synchronized by the same pulsing circuit which actuates the flash tube. A power condenser and relay unit (g) contacts the top of the camera unit. The camera is designed to make 16 flash exposures per foot of boring. Thus with a 1-inch section of drill hole exposed at each flash, and with 16 exposures per foot of boring, sufficient overlap from picture to picture is obtained.

All of the camera equipment is portable into any site where diamond core drilling equipment can enter. A portable 117-volt alternating-current gasoline generator supplies the necessary electric power when other sources are unavailable.

An unusual projector transforms the continuous and overlapping pictures obtained by the camera into true scale cylindrical images. Each picture presents accurately the depth, orientation, and dimensions of every feature of the rock, and on color film discloses much information as to its composition, texture, and soundness. The advantages of the pictures over the rock cores are: elimination of conjecture regarding core losses and orientation (dip and strike) of faults, fractures (as small as 1/100 of an inch), contacts, bedding planes and other structural features of the rock. A compass visible in each picture, permits orientation of all these features on the cylindrical projection screen.



The Chief of Engineers is continuing research designed to improve the efficiency and versatility of both the camera and the projection device.

MINING WORLD wishes to express its thanks to R. H. Nesbitt and E. B. Burwell, Jr. of the Department of the Army, Corps of Engineers, Office of the Chief of Engineers, for supplying information on the "NX" Bore Hole Camera.

"Good service to the lessees is very important," says Brower "Truck" Dellinger, manager of mines. Curt Redding, right, is mine superintendent. RIGHT: The

Constitution Mine of the Spokane-Idaho Mining Company is seven miles southeast of Kellogg, Idaho, in the Pine Creek district.

Spokane-Idaho Block Leasing System Slashes Mine Costs—Hikes Paychecks

Block leasing is Spokane-Idaho Mining Company's answer to the low prices of zinc and lead. Nine months of successful operation at the Constitution mine, southeast of Kellogg, Idaho, have proved that the production cost per pound of metal can be reduced. And the highly selective mining of the lessees has raised the mill heads of the marginal ores as much as 67 percent.

System Has Many Benefits

Besides the reduced cost factor, block leasing offers many other advantages from the company's standpoint. The lessees, working for themselves, mine veins smaller in width than the company would mine and ore dilution is kept to a minimum. This is directly due to the fact that milling costs are split 50-50 between the company and the lessees. The clean mining also reduces the hoisting and tramming costs.

Supervisory, engineering, administrative, and other similar costs are reduced to a minimum. The company does not supervise the lessees in any way; however, it does inspect the working places daily to gather samples and engineering data, and to make certain that the mining is done in a safe manner.

Miners Like Block Leasing

The miners favor the block leasing system for several reasons. First they are able to make more money. Many of the men say that their pay checks average more with this system than they did before. However, they point out that a lot depends upon the block of ground leased to them.

The average amount of money earned by the lessees, as a whole, is more than the day's pay rate prevailing in the area. Except for a few cases, it is even more than the men have made under other incentive systems.

They also like block leasing because they are working for themselves. "We are our own boss," one man stated. "We can take a day off once in a while if we feel like it." He quickly added, though, "If we don't work, we don't eat."

The working hours of those lessees that are in need of hoisting and air are restricted only to the hours that these facilities are operated. The men vote whether or not they should work on holidays, and then notify the company of their decision.

Why Leasing Was Tried

At the beginning of 1953, the Spokane-Idaho, along with many other zinc-lead mines in the United States, really began to feel the pinch of rising costs and declining metal prices. At that time their production labor costs were running as high as 70 percent of their total costs. Faced with the prospect of further drops in the prices of zinc and lead, they had an important decision to make.

Several mines in the district decided to suspend operations pending further development in the price situation. The Spokane-Idaho decided to try block leasing to curtail the high cost of labor. Brower Dellinger, manager of mines for the Spokane-Idaho, had had considerable

WHAT HAS BLOCK LEASING DONE FOR THE SPOKANE-IDAHO?

1. Kept the mine in operation
2. Cut the cost per pound of metal produced
3. Increased the mill heads as much as 67 percent

WHAT HAS BLOCK LEASING DONE FOR THE MINER-LESSEES?

1. Provided them with a job
2. Increased the amount of their paychecks
3. Let them be their own boss

experience with block leasing in the Grass Valley district of California. He instigated a modified block leasing system on a limited scale for the Spokane-Idaho in March 1953. After a few months of successful operation, the entire mine was converted to the leasing plan.

"Block leasing has put us in business for ourselves and we prefer it to the other incentive systems we have tried," says the White Brothers. They are, left to right, Buford, Verle, and Merle. The White Brothers were among the original lessees at the Spokane-Idaho.

What Is Block Leasing?

Block leasing is an incentive plan, shared by the company and the miner-lessee, whereby the incentive is placed upon the grade of ore mined and not on the tons of rock mined. A contract is signed by the company and the lessee giving the lessee the exclusive right to mine a certain block of ground for a period of six months, with a clause permitting renewal on the same terms. This written guarantee protects the prospective lessee's place of establishment. It is his business, his livelihood, and in almost every case is lived up to 100 percent. Except for a description of the leased ground, the written leases are uniform. There are certain agreed charges that have been arranged between the lessee and the company and they provide for equal shares for both lessor and lessee. Under this agreement the company provides the machines, timber, engineering service, accounting, small tools, compressed air, water, and the lease ground, and receives for this a royalty of 50 percent. The miner-lessee furnishes his own compensation insurance, powder, fuse, bits and steel, milling, and any other supplies he may deem necessary to facilitate a better return on his investment. Labor is furnished solely by the lessee and may be through partnerships, profit-sharing plans, or a straight wage basis. He may hire or fire any one he sees fit. He is the complete and only boss within his specified lease block. The ore extracted by the lessees belongs to them. It is handled for their account by the lessor, who does the accounting and in so doing deducts the royalty or company share from the net smelter returns.

The miner-lessee is not obligated to have his ore milled by the company. He may have it milled anywhere he desires. The company mill, however, will accept any amount of ore and will advance the lessee up to 80 percent of his estimated net smelter returns of the concentrate shipped. The company will also transport the ore to the mill, if the lessee wants his ore milled by the company, and furnish the power and water for milling.

Lessee Has Obligations

The miner-lessee is obligated by the contract to fulfill certain conditions. One of these is that he produce enough ore each month to meet his share of the company's expenses. The company's half of the net smelter returns from that lease must cover the expenses incurred by the company in servicing that lease.

The lessee is also required to perform all work in a good, "miner-like" fashion. He must use timber (furnished by the company) wher-

LEFT TO RIGHT: Partners on the 1,800-level Gay Lease are miners Gay, left, and Peyton. The Asher Lease on the 1,000-level is being worked by Chuck Asher. Ronald White, left, and Donald White show some of the ore they have on their 1,200-level lease at the Constitution Mine.

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ever it is required, and must work safely at all times.

Service Is Important

Good service in keeping the lessees supplied with equipment and other necessary items is very important in a successful leasing program, Mr. Dellinger stresses. You cannot just turn the mine over to the lessees. The company should take care of them every way it can, because a man who is not breaking ore is not making money. Administration of this system is likewise very important and can easily be the difference between success and failure.

The blocks that are leased to them should be of sufficient size and grade to enable the lessees to make money, or the company cannot meet expenses. The more money the lessees make, the more the company benefits.

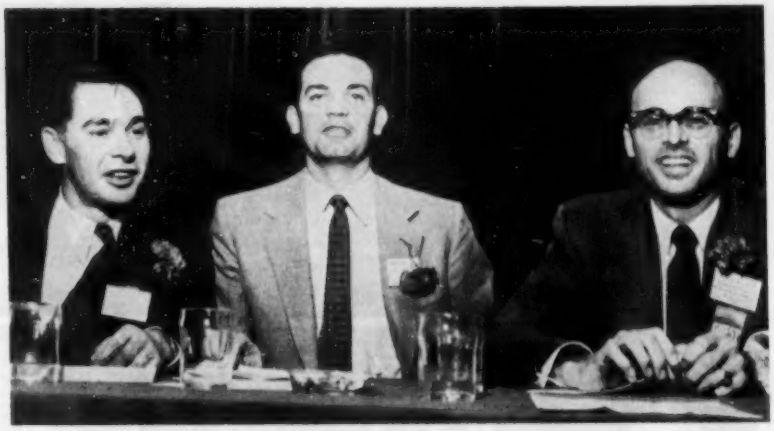
The Spokane-Idaho employs about 18 people to handle the necessary service to the lessees, as well as the mill and office work. There are about 19 miners working underground on five leases at the present time.

Price Is Not Main Factor

The metal price structure is not necessarily the most important controlling feature when deciding upon block leasing, according to Mr. Dellinger. As long as the high cost of labor prevails, this plan might work very well for many mines. To report that anyone who used this system could make a profit under present metal prices might be stretching the point, he continues, but it is certainly more equitable to a small company than most incentive systems.

The application of this system is not limited to small companies. Mr. Dellinger believes that block leasing could be put to advantage in a great many larger operations whose labor costs are becoming too great in proportion to the rest of their total costs.

The Spokane-Idaho Mining Company is located seven miles southeast of Kellogg, Idaho, in the Pine Creek district. Frank N. Marr is president, Brower Dellinger is manager of mines, Curtis Redding is mine superintendent, Onni Herlin is master mechanic, and John H. Wilson, Jr., is chief engineer.



UTEX URANIUM BONANZA was described by Virgil Bilyou, Mitchell Melich, and Charles Steen, the discoverer.

Uranium Highlights Colorado Convention; Lead-Zinc Tariff Both Praised and Damned

Uranium, and more uranium was the paramount topic for the 2,500 miners at the 57th annual National Western Mining Conference. The convention was sponsored by the Colorado Mining Association and affiliated groups and held in Denver from January 28th through the 30th.

Uranium—its origin, how it occurs, prospecting guides to its location, how to mine it, and how it will be used for fueling electric power generation were only a few of the uranium topics discussed.

The uranium boom in Colorado, Utah, New Mexico, Arizona, and Wyoming has been compared to the California gold rush of 1849. Certainly more money has been made in a much shorter time by the most successful prospectors—Charles Steen, Vernon Pick, and Joe Cooper. They were at the convention and told, for the first time, how their prospects had been developed into multi-million dollar mines in the last year.

Uranium Bonanza

Charles A. Steen, president and chief geologist for the Utex Exploration Company, presented the story of his sensational discovery of what is now the Mi Vida uranium mine. Ore was discovered in a diamond drill hole on July 6, 1952, shaft sinking started on October 4, 1952, and first ore was shipped to the U. S. Atomic Energy Commission's Monticello, Utah plant on December 6, 1952. From that date until the end of 1953, a total of 52,542.80 dry tons of ore averaging 0.454 percent U_3O_8 and 1.23 percent V_2O_5 were mined and shipped. Total value of this ore (regular AEC payment, development allowance, initial production bonus, and haulage allowance—minus lime penalty) was $2,381,-350.12. This is a net return to Utex of $46.00 per ton.

"No requests for government assistance were advanced by the Utex Exploration Company nor was any taxpayer's money used in the development of the Utex property," Mr. Steen commented.

He reported that in the Big Indian Mining district, as a whole, there still was 98 percent of the ore left in the ground. Truly his discovery of the Mi Vida and adjoining ore bodies together with other discoveries as much as eight miles away in the later part of 1953 may well make this the biggest bonanza of all time. Other companies who have discovered ore bodies in the district by diamond drilling include Big Indian Mines, Inc., Christensen and Herrin, Big Buck Mining Company, Little Beaver Mining Company, Cal Uranium Company, Western Mining and Development Company, and the La Sal Mining Company.

Cal Uranium Company

Merritt K. Ruddock, vice president of the Cal Uranium Company, Moab, Utah, told how his company had claims staked northwest of Utex on the strike of the ore trend, how the company started prospect drilling in mid-1953, and how a major deposit had been discovered and a large tonnage of ore blocked out by this drilling. The drilling started with holes on 500- to 1,000-foot centers. Ore was hit in the second hole drilled by the United States Atomic Energy Commission. Both AEC and Cal Uranium drilling was then carried out with holes closer together. Since June 1953, an orebody some 2,500 feet long and several hundreds of feet wide has been blocked out. The ore is from 230 to 290 feet below the surface and was encountered at a depth of 250 feet in the company's vertical shaft in January.

Small Uranium Mines Too

For every Mi Vida and Cal Uranium mine, there are several hundreds of really small uranium-vanadium deposits. J. E. Weston, superintendent of mines for the Climax Uranium Company, Grand Junction, Colorado, described a "typical" small mine. The company discovered it in 1953 by surface wagon drilling. Prospect holes were spaced on 50-foot centers. One of the holes hit ore at a depth of 40 feet. Drilling at 25-foot centers did not find ore. Then holes were drilled every 10 feet and ore was found in five additional holes. After close engineering calculations, it was decided to sink an 80-foot-long incline and mine the deposit. (The closest underground mine working was 200 feet away.) After the typical ore body had been mined out—it contained 140 tons of 0.40 percent U_3O_8 and 1.5 percent V_2O_5 ore—a profit of $3.95 per ton was made by the company. Mining cost was $17.25 per ton; development incline, $15.00; discov-

ABOVE: Ozark-Mahoning Company's fluorspar officials are Fenelon Boesche, C. O. Anderson, and A. G. Johnson. At right are Jesse Johnson, Joseph Campbell, and R. S. Palmer. They are talking uranium as this was Commissioner Campbell's first trip to the mines.

BELOW: Gold miners Harry Sears and A. S. Konselman. Crowd at world famous Sowbelly Diner. David Hurley and Ray Sullivan spoke on uranium exploration.

ery drilling cost, $4.00; shipping cost, $2.00; and supervision and engineering, $1.00—or a total cost of $39.25. Mr. Weston emphasized the fact that this ore body would not furnish enough ore to run the Climax mill for one day. Thus, it can be realized that exploration is of growing importance.

Mr. Taft For Imports

In accordance with the long established policy of the Colorado Mining Association, both sides of every question are discussed by the national leaders representing each side of a controversial subject. The Committee for a National Trade Policy has been, and is doing, everything possible to lower tariffs and increase imports. Charles P. Taft, president of the committee, made a special trip to Denver to present his views to the mining industry. He said "High cost payments for domestic mineral production could not make us self sufficient . . . We don't want to run a race for self-sufficiency that undermines our standard of living." He further stated that the domestic lead and zinc mining industry was not in as bad a position as the industry claimed and that there was no need for a tariff when 300,000 annual tons of lead and 475,000 tons of zinc could be produced at a profit at existing metal prices (then 13.5 cents per pound for lead and 10.00 cents for zinc).

Mr. Fletcher Replies

The miner's answer to Mr. Taft and his view point in regard to the proposed tariff (sliding scale import tax) on lead and zinc was given by Andrew Fletcher, president, St. Joseph Lead Company, at the Uranium, Gold and Silver Banquet. Mr. Fletcher said that his company (the lowest cost domestic producer of lead and zinc) could not produce the large tonnages of metal mentioned by Mr. Taft at today's prices nor could all the other mining companies combined. In fact, he said, one industry leader believed that only 100,000 annual tons of domestic zinc could be profitably produced at current prices.

Mr. Fletcher further emphasized the point that Mr. Taft did not have a competent source of information regarding the domestic mining industry or he would not have said that "the assumption and in fact the statement that our costs in the United States are generally higher is absolutely incorrect with the exception of a few certain areas."

National Committee

A report on the activities of the National Lead and Zinc Committee was presented by Otto Herres, chairman. He outlined the steps taken by the committee which represents all the lead-zinc mining districts in the United States in seeking relief through all proper means available.

The committee has made a strong case before the Tariff Commission "to show conclusively that the mines of this country have been seriously injured and smelters have been forced to curtail their operations because foreign lead and zinc are flooding our markets. . . ." While any relief the Tariff Commission can give under the Escape Clause will be limited, the mining industry awaits the report so that definite planning for the near future can be made.

Interior Officials Speak

A growing and vital mining industry in the Western States was forecast by John J. Forbes, director, U. S. Bureau of Mines. He foresaw a great future for the oil shale industry, a fantastic rate of increase for uranium. The future prospects of copper mining are good, he said, and "the west has nothing to fear regarding future prospects for a thriving mining industry."

Assistant Secretary of the Interior Felix E. Wormser, in charge of minerals, reported sound constructive steps were being made to formulate a definite national minerals policy.

"I believe that great care must be exercised in selecting ways and means of establishing a more encouraging mining environment," he said. Perhaps the simplest way to increase production would be by a direct subsidy, he added, but warned that they would be unpopular and should be used only as a last resort.

Both the Secretary and the Department of the Interior have taken the position that a ". . . strong, vigorous and prosperous mining industry is needed by this country."

Important Technical Sessions

While uranium was the metal of greatest interest, the dollar and cents economics of technical processes to make mining and concentration of other ores profitable were described in a series of technical sessions.

The mining, crushing, and conveying operations at the Storke Level of the Climax mine of the Climax Molybdenum Company were described by Max Desseau, Climax mill superintendent. The Storke Level is the culmination of plans which began in 1930. "It is the result not of happenstance, but of careful planning and engineering, of cooperation between designer and operator, and of extensive studies of other mining operations and their problems," he said. Block-caved ore is slusher loaded into 10-ton cars and hauled from the Storke Level to the primary crushing plant. A 60-inch Nordberg gyratory, now operating at 1,800 tons per hour, reduces the ore to minus-8-inches. This ore is then fed to a vibrating screen with 2-inch openings. Oversize is crushed to 2 inches in a 7-foot Symons standard crusher. Crushed ore is belt elevated 4,000 feet with a vertical rise of 340 feet to a storage bin ahead of the fine crusher and adjacent to the flotation mill. Ore transportation by the conveyor requires 0.7 horsepower per ton.

Milling Today at Homestake

Homestake Mining Company, the largest gold mine in the United States, has completely remodeled and reequipped its crushing plants and grinding units at its operations in Lead, South Dakota, according to Nathaniel Herz, chief metallurgist. Short head cone crushers are doing a large part of the work formerly done by stamps. There are now three identical grinding units, each with a daily capacity of 1,350 tons. Marcy 6- by 12-foot rod mills are used for primary grinding of the minus-½-inch, slot-screened ore. Each discharges to an Allis-Chalmers 9- by 11-foot ball mill. Ball mill overflow is classified by a Dorr HX classifier. Amalgamation starts in the rod mill where about one-third of the quicksilver is added; the remainder to the ball mill.

"The new system has reduced power consumption by 2.25 kilowatts per ton. . . . Crushing now does part of the work formerly done by stamps, probably between one-half and two-thirds; the 7.4 kilowatt hours used in rod and ball milling does more work than the 8.0 previously used in rod, ball, and pebble milling," Mr. Herz reported.

Chemical Treatment of Ores

C. A. Romano, resident manager, Intermountain Chemical Company, Green River, Wyoming, told how his company had developed a trona mine and a chemical plant to produce soda ash. The flat-lying, 10-foot-thick trona bed is mined by six types of electrically powered machines. All are self-propelled and mounted on rubber tires or self laying tracks. The mining cycle includes: undercutting, drilling, blasting, loading, short hauling, belt conveying, and hoisting. Roof bolting is used for ground support.

Uranium Ore Genesis

Dr. John W. Gruner, professor of geology at the University of Minnesota, has done much field and laboratory work seeking the answer to how uranium was formed. Dr. Gruner's paper was especially timely because he had made several important tests in his laboratory only a few weeks before the convention.

Ideas and arguments have been advanced and are continuing in regard to the origin of the uranium deposits of the Colorado Plateau. Mostly "in respect to the introduction of the metal and if the deposits are syngenetic or whether they are hydrothermal."

Until the discovery of pitchblende in the Happy Jack mine in White Canyon, San Juan County, Utah, in 1950, it had always been thought that pitchblende had been formed from hot solutions. However, Dr. Gruner has since been able to make the mineral in his laboratory at low temperatures in less than 24 hours by reduction of uranyl sulphate by simple chemical reduction with H_2S and Fe^{++}. Pitchblende has now been found in more than 30 places. Thus Dr. Gruner has proven in the laboratory that pitchblende could be formed and from this he has gone on to deduct the possible formations of the ore bodies in the following manner: "The rocks containing the ores are essentially flood plain deposits. . . . Vast amounts of volcanic

ABOVE: George Teal, Colorado tungsten miner welcomes Nevada operators Ray Hendrickson, F. A. McGonigle, and L. D. Gordon, BELOW: Uranium leasing by AEC is discussed with Vernon Pick, W. H. H. Cranmer, F. L. Seymour, S. P. Wimpfen, G. T. Rummel, and W. Waldeck participating.

LEFT TO RIGHT: R. C. Pruess, Climax Uranium Company; Charles P. Taft, Committee For a National Trade Policy; Sheldon P. Wimpfen, U. S. Atomic Energy Commission; and D. B. Pinnell, Union Pacific Railroad were featured speakers at the Industry-wide convention of the Colorado Mining Association.

LEFT TO RIGHT: James A. Ross, Sprague and Henwood, at the exploration drilling session. Miles P. Romney, Utah Mining Association and Richard A. Young, American Zinc, Lead and Smelting Co. speaking on Zinc. C. A. Romano, Intermountain Chemical Co., described "Chemical Treatment of Ores".

ash beds, now mudstones and silts, were interstratified with the Shinarump, Chinle, and Morrison (the three main ore-bearing formations). . . . These volcanic ash beds may have contained most of the original uranium in from 4 to 10 parts per million. Some of the metal was easily leached at this stage and easily concentrated in some beds. . . . Toward the end of the Laramide Revolution much of the uranium was concentrated around the plant and hydrocarbon materials which were in a condition of reducing metals to their sulphides (pyrite predominates) and uranium to pitchblende and coffinite."

Wyoming Uranium Resources

In the last six months the entire state of Wyoming has been the locale for a series of uranium discoveries. Dr. Horace D. Thomas, Wyoming Geological Survey, Laramie, Wyoming, outlined the geology and mining of uranium in the state. The most important discovery to date has been in the Carlile area of northeastern Wyoming, he said.

It is very interesting to note that Dr. Thomas's paper credited Dr. David Love of the United States Geological Survey as arriving at essentially the same origin for uranium in Wyoming as does Dr. Gruner for that of the Colorado Plateau. "It is Dr. Love's belief that the uranium minerals had their origin in the Tertiary volcanic ash beds which once mantled most of the state, that uranium was leached out of these ash beds by ordinary ground water, was transported in solution, and was deposited upon entering suitable host rocks. New discoveries seem to prove the validity of the theory, and if it is correct, it immediately becomes apparent that uranium deposits may be expected to occur at almost any place in the state."

New Officers Elected

Harold A. Worcester, president of Worcester Mines Company, Montrose, Colorado, was elected president of the Colorado Mining Association for 1954.* Vice presidents elected are: E. D. Dickerman, consulting engineer, Leadville; M. P. Cloonan, Ozark-Mahoning Company, Walden; G. T. Rummel, La Salle Mining Company, Grand Junction; and Max Bowen, Golden Cycle Corporation, Cripple Creek. H. W. C. Prommel, Denver consulting geologist, was reelected treasurer. Robert S. Palmer was unanimously elected executive vice president.

Why Convention Successful

This convention was not just another convention. It was a meeting of engineers, prospectors, and miners who came to learn—to learn how the other company was cutting costs, to learn how to find uranium, and, most importantly, to share know-how for the good of the entire industry.

The ever crowded meetings had a serious air. Everyone present was determined to learn everything possible. Every word, from the scores of speakers, was heard, pondered, and evaluated.

The mining industry leaders came to Denver; they were in a serious mood; they attended every session, stayed to the end, and learned better how to produce more minerals.

Much good will come from the convention—good for both the prospectors, mining companies, and the nation. Congratulations to the Colorado Mining Association and sincerest thanks to the many participants which made this all-industry convention so worth-while.

* Mr. Worcester was stricken with a fatal heart attack on the third day of the convention and died February 1. See Obituaries—Ed.

John D. Mitchell Tells of

LOST MINES AND BURIED TREASURES

THE LOST TAYOPE MINE

The Lost Tayope Mine is said to be located somewhere in the wild Yaqui Indian country north of the Vacatete (Cowteat) Mountains in the State of Sonora, Mexico. Like all mines located in remote Indian country, the Tayope was very rich. The wilder and more savage the Indians, the richer the mine was reported to be, and old records indicate that the Tayope was the richest of them all. No mine was ever more completely lost, or more diligently sought, than the Tayope.

The Spanish conquistadors are said to have discovered the mine in the year 1635. Records in the old church at Bavispe show that children were brought there from Tayope to be baptized. Later, a church was erected at Tayope and these trips ceased.

In the year 1767 the Jesuits were expelled from Spain and all its possessions, and Tayope was sealed and abandoned. The mining camp and near-by church were soon thereafter destroyed by the Yaqui Indians. Tradition has it that gold bullion valued in millions of dollars was stored away in the mine before it was abandoned by the padres.

Many expeditions from Spain, as well as parties sent out by American mining men, have diligently searched the mountains of northern Sonora, Mexico, for the lost Tayope.

There is a legend among the Mayo Indians living in the vicinity of Navajoa on the lower reaches of the Mayo River that conductas (pack trains) loaded with gold bullion came down from Tayope once every year. They bore one-fifth of all the gold that had been produced. This part was known as the "Royal Fifth" and belonged to His Majesty, the King of Spain. These conductas, it is said, crossed the Mayo River at a point now known as Santa Barbara, then headed east past the ancient mining camp of Topago and on down through the Chinipas Pass to the City of Mexico. According to the Mayos, these conductas were often attacked by both Yaqui and Mayo Indians and, as a result, great treasures lie buried in a field on the Santa Barbara Ranch. This field, they say, lies just south of the ranch building that stands like a huge feudal castle on the high point of land on the south bank of the river.

Many years ago the Mexican government rounded up a large number of Yaqui Indians and deported them to the swamps of Yucatan. One of these Indians escaped and made his way back to his old home in the Vacatete Mountains. Near the end of his journey he stopped at the home of the writer (who at that time was living in southern Sonora) and asked for food. This Yaqui spoke Spanish, for previous to his deportation he had been employed on a ranch in the Yaqui Valley.

When asked if he knew anything about the Lost Tayope Mine, said by many to be located in his country, he replied that the mine was not far to the north of his home in Cerro Azul (Blue Mountain). He added that it was an "antigua" and had been worked by the Spanish. The mine, he said, was on the north side of the mountain in heavily timbered country, and that the workings had caved taking down large trees with the rocks and earth. He described a canal, 11 kilometers in length, which came down from an arroyo to the church near the foot of the mountain and to the arrastres where the ore was ground. The ruins of the canal and the tumbled-down walls of the church were still visible, he said, and five bells of different sizes and with the name "Tayope" molded on them still lie near the fallen church tower.

Many prospectors, both Mexican and American, have disappeared while searching for the Los Tayope. They are believed to have been murdered by the wild Yaqui Indians who inhabit the country around the base of Cerro Azul.

The presidente (mayor) of old Nacori to the west once said that his grandfather told him the Tayope was located so near that on a still night the inhabitants of Nacori could hear the church bells ringing in Tayope.

Those who would search for the Lost Tayope Mine would do well to heed the old presidente's words.

Five bells of different sizes and with the name, Tayope molded on them still lie near the fallen church tower.

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ACTIVITIES OF U. S. MINING MEN

ROBERT C. TALBOT is now manager of raw materials development of United States Steel Corporation's Columbia-Geneva Steel Division succeeding the late H. C. BURRELL. Mr. Talbot formerly was an assistant manager for the division. During his career at U.S. Steel, he has held positions at the Carnegie-Illinois Steel Corporation Works in Chicago, Columbia Defense Plant in Geneva, Utah, and at the H. C. Fricke Coke Company in Union Town, Pennsylvania. His office will continue to be in San Francisco, California.

Paul Henshaw, geologist for the Homestake Mining Company of Lead, South Dakota, made a brief trip to Moab, Utah, last month. Homestake has just concluded negotiations to purchase all capital stock of the Little Bear Mining Company in the San Juan Area. The little Bear claims reportedly may be one of the richest uranium bodies in the region.

Wing G. Agnew is chief of the U.S. Bureau of Mines Region II, succeeding **M. E. Volin.** Mr. Agnew will supervise the bureau's activities in Washington, Oregon, Montana, and Idaho from his office in Spokane, Washington. Also working from the Spokane headquarters is **Neal M. Muir**, who has been doing examination work for the bureau since October.

Lewis L. Huelsdonk, general manager of Best Mines Company, Inc. in Sierra County, California, has been named to the State Mining Board by Governor Goodwin J. Knight. Mr. Huelsdonk has been associated with the Best interests since 1933.

C. R. Pratt, general mill foreman for Kennecott Copper Corporation at Hayden, Arizona, retired February 1. Mr. Pratt had been with Kennecott 42 years.

Walter Wells is now a shifter at Telluride Mines, Inc., in Telluride, Colorado. He had been employed for the past seven years by the Idarado Mining Company at Ouray.

Eastern Oregon Mining and Mineral Association officers for 1954 are: **Bill J. Wendt**, president; **Joe G. Balthazor, Ivan Thompson, C. C. Clement**, and **I. B. Hazeltine**, vice presidents; **Fred Moes**, treasurer; **Nadie Strayer**, secretary; **Orville Fleetwood** and **Paul Van Arsdale**, trustees, and **Alec Poston, George Bailey** and **Jesse Edwards**, directors.

Promotion of four men at the M. A. Hanna Company's Michigan mines was announced recently. **William S. Nichols** was appointed master machanic at the Cannon mine; **Frank Mattson** became mechanical engineer for the Homer and Wauseca mines, **Edwin Rousseau** took over the job of surface foreman at the Homer mine, and **Wallace Choquette** became Cannon mine's chief electrician.

Elmer Isern, vice president of the Eagle-Picher Company, and manager of its mining and smelting division at Miami, Oklahoma has resigned. Mr. Isern, who is credited with originating the centralized milling process which has saved millions of dollars in the lead and zinc industries, said that he plans to devote an indefinite period to private business and to enjoy a long-anticipated rest. He began work at the Commerce Mining and Milling Company in Miami, in 1926, staying on as superintendent of milling when Eagle-Picher bought the company in 1939. It was while here that Mr. Stern initiated the use of centralized mills, thus saving small mining properties the expense of their own mills and leading to economical mining of low-grade ores.

Officers for the Nevada Mining Association were elected in Reno last month. They are: **John C. Kinnear, Jr.**, manager of Kennecott Copper Corporation's Nevada Mine Division, president; **A. E. Millar**, manager of Anaconda Copper Company's Yerington mine, first vice president; **Roy A. Hardy**, consulting engineer for Getchell Mine, Inc., second vice president, and **Louis D. Gordon**, executive secretary and treasurer.

Wesley P. Goss, vice president and general manager of Magma Copper Company and its subsidiary, San Manuel Copper Corporation, has been elected to the presidency of both corporations. Maintaining headquarters at Superior, Arizona, Mr. Goss will continue as manager of both firms. He succeeds **A. J. McNab**, who is now chairman and chief executive officer for both Magma and San Manuel.

Howard L. Waldron, former New York District Manager for MINING WORLD, has assumed the position of regional product sales manager for a number of firms supplying chemical products for the mining and allied industries. With a territory covering Arizona, New Mexico, Nevada, Utah, Colorado, Wyoming, Idaho, and Montana, Mr. Waldron will make his headquarters at Salt Lake City, Utah.

Twenty-three members of the American Institute of Mining and Metallurgical Engineers, which has headquarters in New York, were added to the group's Legion of Honor for maintaining their membership continuously for over 50 years. Those honored were **John J. Blow**, Barbados, British West Indies; **John M. Boutwell**, Salt Lake City, Utah; **Arthur J. Boynton**, Chicago, Illinois; **John M. Brooks, Jr.**, El Paso, Texas; **George W. Bryant**, Los Angeles, California; **Louis S. Cates**, New York, New York; **R. H. Channing**, New York, New York; **H. McL. Cobb**, Guanacevi, Mexico; **Frederick H. Dakin**, Burlingame, California; **F. Julius Fohs**, Houston, Texas; **Stephen L. Goodale**, Pittsburgh, Pennsylvania; **F. W. Guernsey**, Vancouver, British Columbia; **H. Hunter**, Tokyo, Japan; **Charles H. Jones**, Forfar, Scotland; **L. Lindsay**, Chichester, England; **Edwin W. Mills**, Salome, Arizona; **George W. Paymal**, Altadena, California; **Roger T. Pelton**, La Jolla, California; **Juan de la C. Posada**, Antioquia, Columbia; **John W. Prout, Jr.**, Beverly Hills, California; **George A. Schroter**, Brooklyn, New York; **G. A. Swanquist**, El Salvador, and **Louis A. Wright**, Palo Alto, California.

John H. Eggers has been re-elected president of the Mining Association of the Southwest for a third term at the

Four prominent members of the mining industry were honored at the 1954 general meeting of the American Institute of Mining and Metallurgical Engineers in New York February 17. They are (left to right) WILFRED SYKES, executive committee chairman for Inland Steel Company, who received the Charles F. Rand Memorial Medal for "distinguished achievement in mining administration"; SIMEON S. CLARK, general superintendent of the Tri-State Mines, Eagle Picher Company, who was awarded the William Lawrence Saunders Medal for his "distinguished abilities as a mining engineer"; W. J. KROLL, scientific leader in the titanium industry, who was presented with the James Douglas Gold Medal; and C. H. BENEDICT, A.I.M.E. director, who received the Robert H. Richards award for achievement in the copper industry. All four men received their awards at the Institute banquet, which was one of the highlights of the annual meeting in New York City.

group's annual meeting in Los Angeles, California. Re-elected with Mr. Eggers were **H. W. Hower**, vice president; **S. Paul Lindau**, second vice president, and **P. J. Osdick**, third vice president. **George W. Nilsson**, mining attorney, was named secretary to succeed **Victor J. Hayek**, who was recently appointed Superior Court Commissioner in Los Angeles County.

R. R. Williams has been named to the newly created post of assistant manager at the Colorado Fuel and Iron Corporation mining department, which supervises operations in Colorado, Utah, and Wyoming. Mr. Williams formerly was superintendent of the firm's blast furnaces at Pueblo, Colorado.

New staff members at the Climax Molybdenum Company in Climax, Colorado include **Thomas Armstrong Hoy**, assistant safety engineer; **Carl DeTemple**, protection manager; **Max Gelwix**, planning engineer; **Mark Hamilton**, geological draftsman; **Hubert R. Moody**, director of training, and **Don Stephens**, public relations assistant.

W. F. Shinners has been named general superintendent of Michigan mines for the M. A. Hanna Company. Replacing Mr. Shinners as district superintendent of the Iron Mountain mine in Iron Mountain, Missouri, is **Floyd H. Lee**, who has been employed as a mining engineer at the mine.

R. N. Sunderland and Edwin Kehr have joined the engineering staff of Humphreys Gold Corporation. Mr. Sunderland, who will work at the Trail Ridge Plant, comes from the Newark plant of E. I. du Pont de Nemours & Company, Inc. Mr. Kehr had been employed by the U. S. Gypsum Company and the Illinois Division of Highways and will be employed at the new facilities at Lawty.

GEORGE T. HARLEY, formerly manager of the New Mexico properties of the International Minerals & Chemical Corporation's Potash division became consultant for the division on January 1. He had managed the New Mexico properties since 1944. Succeeding Mr. Harley as manager is CARL A. AREND, who has served as assistant manager for two years. Mr. Harley will retain his offices at the plant in Carlsbad, New Mexico.

Officers re-elected by the Grass Valley-Nevada City, California, Mine Workers Protective League include **William Penaluna**, president; **Thomas Mackey, Jr.**, vice president; **Walter Bender**, recording secretary, and **Del Benetts**, financial secretary.

Dave Wooster is the new works engineer at Basic Refractories, Inc. in Gabbs, Nevada. Mr. Wooster will be in charge of maintenance at the extensive operation and will supervise construction of new facilities.

Samuel Katz, geophysicist at the Stanford Research Institute, has been awarded the 1953 George Frederick Kunz prize in Geology and Mineralogy. The award, given by the New York Academy of Sciences, was made for Mr. Katz' paper on "Seismic Study of Crustal Structure in Pennsylvania and New York."

Wayne MacKenzie is now a field geologist for the American Metals Company with his first assignment in New Brunswick, New Jersey. Previously, Mr. MacKenzie was with the Day Mines, Inc., in Idaho.

Calvin L. Dickinson has joined American Potash and Chemical Corporation as an advisory engineer at the company's Trona, California, plant. **Frank A. Jessup** is the new safety engineer at the plant.

OBITUARIES

Harold A. Worcester, 62, mining leader in the Colorado area, died of a heart attack February 1 in Denver just four days after being elected president of the Colorado Mining Association. Mr. Worcester had been attending the National Western Mining Conference when he was stricken. Known throughout the mining world, Mr. Worcester was superintendent and later manager of the famous Smuggler mine at Telluride, Colorado. More recently he had obtained his own mine near Uravan and was engaged in uranium development. He had also been acting as a mining consultant in Montrose during the past few years.

Lewis E. Young, consulting engineer and past president of the A.I.M.E., died December 27 at his home in Pittsburgh, Pennsylvania. Dr. Young was director of mining at the Colorado School of Mines for several years and served as an instructor at several other colleges before entering private business. He had been a consulting engineer for 15 years and was A.I.M.E. president in 1949.

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ACTIVITIES OF INTERNATIONAL MINING MEN

JAMES B. REDPATH is the new executive vice president of Dome Mines, Ltd. of Toronto, Canada. He is presently serving as general manager of the company's Sigma Mines, Ltd. in Quebec and is president of the Quebec Metal Mining Association. Mr. Redpath has been with Dome Mines since 1931, working at Sigma Mines since its beginning in 1934. In his new post Mr. Redpath becomes president of Dome Exploration, Ltd. and Mindamar Metal Corporation, both of Quebec, and vice president of Sigma Mines and Campbell Red Lake Mines, Ltd.

Clifford Waite, chairman and managing director of the Consolidated Tin Smelters, Ltd. of London, England, has been visiting in Singapore and Penang, Malaya. While in Singapore he met with **Sir Ewen Fergusson**, manager of Straits Trading Company, Ltd. The Penang trip included a visit to the plant of the Eastern Smelting Company Ltd., which is a subsidiary of Consolidated Tin.

Sven Ljungren, mining geologist from the Uppsala region, has been added to the staff at the Malmberget mines in northern Sweden.

Charles D. Michaelson, general manager of Braden Copper Company in Chile, has assumed the position of vice president of the firm. As such, he will be the chief executive for Braden in Chile. Mr. Michaelson will maintain offices in Santiago for the company, which is a subsidiary of Kennecott Copper Corporation.

Francis Thomas, vice president of Orinoco Mining Company, was named president of the United States Steel Corporation subsidiary in New York. He succeeds **Mack C. Lake**, internationally known mining engineer and geologist, who supervised the post-war developments of U.S. Steel's iron ore deposits at Cerro Bolivar, Venezuela. Mr. Lake will continue to work with U.S. Steel as a consultant.

P. J. Crowley, formerly with the N.S.W. Mining Company Pty., Ltd. in Australia, is now employed by Anglo-Oriental, Ltd. in Kuala Lumpur, Malaya.

Staff appointments at the Consolidated Mining and Smelting Company of Canada, Ltd. were made at Trail, British Columbia in January. **D. D. Morris**, manager of the research and development division, has been appointed administrative assistant. He is succeeded as division manager by **A. D. Turnbull**, assistant manager of the metallurgical division. Mr. Turnbull's former post has been assigned to **T. H. Weldon**, superintendent of the zinc department.

A. Gouka, formerly employed as a mining engineer with Dorr-Oliver N.V. in The Netherlands, is now in Bolivia where he is working as a hydrometallurgist for the UNTA-Mission in La Paz.

Henry G. Schuring has joined Atlas Consolidated Mining and Development Company in the Philippine Islands as mill superintendent of the firm's new copper concentrater at Toledo, Cebu. Mr. Schuring comes from Bonanza, Nicaragua where he held a similar position with the Neptune Gold Mining Company.

The Third Guiana Geological Conference was concluded recently in Georgetown, British Guiana. Among those attending the conference were **F. C. d'Audretsch, Charles Bleys**, and **Dr. V. C. de Munck**, all from the geological mining department in Surinam and **H. Schols**, director of the Surinam geological and mining service. The four officials have also been studying geological developments in French Guiana.

C. J. Sullivan, former member of the Australian Bureau of Mineral Resources, is currently visiting in the United States.

W. H. Dennis has left the Abbeyton Mining Company in Erie to assume the position of mill superintendent for the Cyprus Sulphur and Copper Company. He will be working at the Limni Mine in Polis, Cyprus.

Harry Shaw, electrolytic refinery manager for the Utah Copper division of Kennecott Copper Corporation, has returned to the United States from Germany. Mr. Shaw had been studying metallurgical processes in industry in the Hamburg vicinity.

G. H. Newman, former manager of Marscon, Inc in the Philippine Islands, is now manager of the mines division of Marsman and Company, Inc. in Manila. He succeeds **J. B. Stapler**, who has become a consulting engineer for Marsman.

A. W. FAHRENWALD, dean of the College of Mines at the University of Idaho, will retire September 1 to devote his full time to consulting work and manufacture of the mineral processing equipment he has been developing for the past 30 years. Dean Fahrenwald, who has been given the title of Dean of Mines, Emeritus, will continue to work on several unfinished research projects at the university. He will also maintain an office at the General Machinery Company plant in Spokane, Washington. General Machinery manufactures the ore and aggregate processing equipment which Dean Fahrenwald has developed. This equipment includes the Fahrenwald flotation machine, the Fahrenwald hydrosizer, and a new machine now being widely tested on the iron ranges of Minnesota, the "hydroscillator," which combines the hydraulic principle with mechanical oscillation.

ALLEN D. CHRISTENSEN was elected president of the Utah Construction Company at a recent meeting of the firm's Board of Directors in San Francisco, California. He succeeds LESTER S. COREY, who recently was appointed Civilian Consultant to the Assistant Secretary for Defense. Mr. Christensen joined Utah Construction Company upon graduating from college and has worked his way up through the ranks to his present position. He was named general manager in 1950 and has been executive vice president since 1951. The firm has large iron operations in Peru and British Columbia, as well as in the United States. It is handling facilities for San Manuel Copper in Arizona and is currently under contract with the South Korean government to work several tungsten mines in that country.

John M. Smith, United Nations Technical Assistance Administration engineer from Stroud, England, is on his way to Taiwan to study methods of improving iron and steel production in Formosa. He has also been consulting with Philippine officials in Manila about the possibility of that country getting further technical aid from the UN. **Sven Hjerdin**, UNTAA expert, had been working with Philippine authorities in planning construction of a new iron and steel plant on Mindanao until illness forced him to return to Sweden.

Truman H. Kuhn, dean of the graduate school at the Colorado School of Mines, has returned from Turkey where he has been estimating chromium reserves near Orhaneli, 120 miles south of Istanbul. Dr. Kuhn spent approximately a month in the Orhaneli region, one of the top chromium-producing areas in Turkey.

M. A. Mawby, well-known Australian mining engineer and member of the Melbourne board of directors for the Zinc Corporation, Ltd., has been named an honorary member of the Chemical, Mining and Metallurgical Society of South Africa.

Merlyn G. Woodle, who recently returned from Liberia, West Africa, where he has been acting manager for the Liberia Mining Company, Ltd. operations, has been appointed superintendent of Republic Steel Corporation's Minnesota ore mines. He succeeds the late **J. H. Hocking**. In his new position Mr. Woodle will supervise operations of Republic's Susquehanna, Stevenson, and St. Paul mines at Hibbing.

Pete Sandvik, former Assayer for the Territorial Department of Mines at Anchorage, Alaska, will take over the Assayer-Engineer post at Nome in April. He succeeds **Daniel Hones**, who resigned December 31. Handling the department's affairs until Mr. Sandvik's arrival is **M. E. Kelly**.

"Scramming" on the Mesabi

INTERNATIONAL TD-14A puts speed and power into one of the first operations of its kind in the east end of Mesabi Range. Lenci & Politano took the "scramming" contract for the removal of small pockets and deposits of ore remaining after the big equipment had been taken away. They report the little crawler was just right for the close quarters and heavy going.

INTERNATIONAL Crawler makes a big impression on east end of the Range

What's "scramming?" It's cleaning up the small pockets and deposits of ore that remain after main ore body has been worked. It is a job that brings out the special abilities of smaller crawlers in the complete INTERNATIONAL line according to Lenci & Politano, "scramming" contractors in the east end of Mesabi Range.

An INTERNATIONAL TD-14A was used in the operation. Operator Leonard Lehman, who had always handled big crawlers before, has this to say:

"The way that tractor can get around in tight corners and the size of the load it can handle were things I had not expected. It showed me there is a place for the smaller INTERNATIONAL crawler even in such a big operation as mining the Mesabi Range!"

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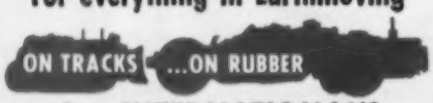

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Inco Ships First Metallic Nickel Under US Contract

The International Nickel Company of Canada, Ltd. has made its first shipment of metallic nickel from its Port Colborne, Ontario refinery under a contract calling for quick delivery of 120,000,000 pounds of the metal to the United States over a five-year period ending in 1958. The contract was signed with the United States Defense Materials Procurement Agency in June 1953. (See MINING WORLD, July 1953, page 67 for details.)

Regular deliveries will be made at a monthly rate of 2,000,000 pounds until the contract is completed. With the additional output, Inco's rate of nickel production is now approximately 275,000,000 pounds per year.

Canadian Mining Group Seeks Alaskan Sea Outlet

Access to the sea through the Alaska Panhandle for northwestern British Columbia is being sought by the Chamber of Mines in Vancouver, B.C., as a logical preliminary to large-scale waterpower and metallurgical development in that region.

While tremendously rich in metals and waterpower, this section of British Columbia is shut off from economical transportation by the fact that the coastline belongs to Alaska. The Chamber of Mines and other interests who have studied the situation contend that to attain the area's full industrial potential there should be one or more "avenues" across the Panhandle so that Canada could proceed with development of her own deepwater ports. These would serve hydro-electric and metallurgical plants that would follow harnessing of the waterpower resources of the Atlin-Teslin-Tagish Lakes area.

The Chamber of Mines argues that Alaska would also benefit tremendously from such access strips inasmuch as the developments contemplated would encourage the overall expansion of the entire region. In return for the land involved, it might be possible to work out some plan for Alaska Territory or United States industrial interests to share in the power to be developed in that part of British Columbia.

This project has suddenly aroused attention because of the surveys now being undertaken by Ventures, Ltd., to determine the feasibility of the proposed power project. Reports indicate that a 25,000-horsepower pilot plant may be established next year as a forerunner of one of the world's greatest power enterprises calling for the ultimate expenditure of about $1,000,000,000 for the development of 4,500,000-horsepower. Such a project would roughly double the cost and magnitude of the Aluminum Company of Canada's power and smelter program for Kitimat and Kemano, now under way.

Small Rhodesian Asbestos Mines Close; Large Expand

Adjustments to peacetime operation and increased competition of Rhodesian chrysotile cross-fiber asbestos have ended the postwar boom on world markets for slip-fiber asbestos. Difficulties in disposing of slip fiber during recent months have resulted in leveling off of prices from the peak period, and consequently a number of Southern Rhodesian producers have had to close down.

Rhodesia Monteleo Asbestos Ltd. has suspended operations and placed the Slip mine on a caretaking basis after producing only 700 tons of slip fiber from January to August 1953. At the same time, Rhodesian Chrysotile Corporation closed down its Gurumba Tumba mine at Belingwe. During its eight months of operation in 1953, only 460 long tons of slip fiber were produced. The Alpha mine of Pamco Mines Ltd., another slip-fiber producer, closed and was placed on a caretaking basis, while the Coronation Syndicate Ltd., controlled by London & Rhodesian Mining & Land Company Ltd., relinquished its three-year development option on the Ratanyana slip-fiber claims at Lower Gwanda, after having carried out intensive exploratory work since 1952.

While slip-fiber producers have suffered an irreparable setback because of normalization of the market, larger chrysotile cross-fiber producers have continued to operate at prices drastically reduced to present market conditions. For example, total asbestos production in Southern Rhodesia in August 1953 amounted to 7,533 tons, i.e. 100 tons more than in July, but the total value decreased by £142,128 to £481,473, The overall average value per ton decreased from £84 in July to £64 in August.

Small operators producing only short grades of fiber are gradually closing as market demands become more exacting because of difficulties in producing uniform standard grades and qualities with their small mills. At the same time, though, larger mines are increasing their output and planning extensions. The Johns-Manville Corporation, Simon I. Patino interests, Anglo-Huronian Ltd., and British Metals Corporation have formed a subsidiary, Rhodesian Asbestos Ltd., to undertake a large-scale £6,500,000 program to produce short-grade cross fiber from the Temerraire, Shashi, and recently acquired Shamala mines at Mashaba near Shabanie. The company is also doing exploratory work on the Rosy Cross claims, a promising prospect at Mashaba.

Promising Uranium Find At Norseman, Australia

Norseman Gold Mines N.L., which has for some time been a sulphur producer (pyrite ore and pyrite concentrate), has staked claims covering 50 acres 15 miles south of Norseman in Western Australia after prospecting disclosed radioactivity. The find was made in conjunction with Uranium Mines N.L., a company recently formed to prospect, mine, and otherwise exploit uranium ore deposits.

The radioactive element is said to be uranium occurring in sufficient quantities to possibly make the field of importance in Australia. At any rate, shares in Uranium Mines which were paying 2/ jumped to 28/, and Norseman shares have almost doubled in price.

John Daniel Yorga has applied to the Commonwealth government for a reward of £A 25,000 for the Norseman discovery. Mr. Yorga was previously at Rum Jungle which was the third uranium field to be developed in Australia.

Summary of 1953 Mining Events at B. C. Meeting

Describing 1953 as a "thrilling year" for mining, Dr. Harry V. Warren, president of the British Columbia and Yukon Chamber of Mines, recently recalled some of the year's most notable events at the annual meeting of the Chamber in Vancouver in January.

Among the major achievements listed by Dr. Warren were the following:

1. Start of asbestos production at Cassiar Asbestos, giving western Canada its first significant output of this important industrial mineral.

2. Discovery of what may become a major copper deposit at the Granduc mines of Granby Consolidated Mining Smelting and Power Company Ltd. Two local B.C. prospectors made the find.

3. Continuing development by Western Nickel in its new low level tunnel now in over a mile and 950 feet below the upper tunnel.

4. Completion of Alcan's great tunnel through the Coast Range and this year should see the production of aluminum in British Columbia.

5. Continuing expansion by Consolidated Mining and Smelting Company—both of water power at Waneta, of plants at Trail and Kimberley, and of the Sullivan mine itself.

6. Completion of preliminary surveys by Frobisher Ltd. of the water power potentialities of the Yukon River, leading to possible future development.

7. Shipment of almost a million tons of iron ore to Japan. This is particularly noteworthy, according to Dr. Warren, because until 1945 the whole of Canada had not produced 1,000,000 tons of iron ore in one year.

8. Promising indications of future development such as Prospectors Airway's showing on the Pelly River.

Work Ceases On English Tin-Tungsten Deposit

Wolfram Prospecting Syndicate Ltd., a joint venture of London & Scandinavian Metallurgical Company, Ltd., New Consols Mines Ltd., and Campbell, Gifford & Morton Ltd., has suspended exploration work at the Trebartha Lemarne tungsten-tin deposit on the northeastern edge of the Bodmin Moore Granite in eastern Cornwall, England. The mine is now on a caretaking basis.

Considerable exploration work had been carried out during the last two years by the firm, starting at the granite contact and resulting in the development of some 10,000 tons of ore. Since January 1, 1953, 3,500 tons of ore—that is, enough to study the amenability of the ore for concentration—had been mined and custom-milled at New Consols' concentrator located at nearby Luckett. Run-of-mine ore averaged 0.55 percent WO_3 and 0.17 Sn. Tungsten occurs as wolframite and scheelite, and tin as cassiterite; pyrite and arsenopyrite are present.

Although makeshift equipment was used for mining, and although the mill was not designed for the job, the total production of concentrate as of December 31, 1953 amounted to 15 tons of wolframite (average 71.5 percent WO_3 and 0.8 percent Sn) and some 12 tons of mixed scheelite-cassiterite (average 27.0 percent WO_3 and 40.0 percent Sn.)

SURINAM—The period from June to December 1953 was marked by various activities with respect to bauxite. *Surinam Bauxite Company* completed its new drying and calcining plant at Moengo, consisting of four dual-purpose kilns for chemical and calcined bauxite and additional loading and shipping facilities. Together with Paranam production, Surinam Bauxite expects its calcined bauxite output for 1954 to be about 120,000 metric tons compared with about 50,000 metric tons in 1952. Another feature of Surinam Bauxite Company's development is its new research work on the treatment of high-iron bauxite.

MEXICO—The miners union has asked the federal government to take over copper mines at Santa Rosalia, Baja California, which had been worked for 80 years by *Cia Minera El Boleo*, S.A. The firm now plans to abandon its operations which, it contends, are unprofitable because of the low metal prices. The union maintains that El Bodeo is currently producing 300 tons of copper daily and that this ore is so high grade that it refutes the company's contention of unprofitable operation. The union hints that bad management is the real problem and that this could be corrected under the federal government's jurisdiction. Cited as an example by the union is the case of *El Triunfo* copper mine, about 30 miles south of La Paz, Baja California. This mine was also abandoned by its owners as an unprofitable operation, but under the administration of the Mining Stimulation Commission, El Triunfo is reported to be a paying business expected to show a profit of $580,000 this year.

PERU—A large iron ore deposit has been reported near Zana in the Department of Lambayeque, about 30 kilometers southeast of Chiclayo and some 20 kilometers from the coast.

BRAZIL—Silver production during the period from January to September 1953 was 431,000 grams. During that same period, gold production reached three metric tons.

CHILE—After much discussion with United States copper companies operating in Chile, the government has agreed to a single tax in place of discriminatory rates. The tax, however, will be 75 percent on profits. The measures are expected to help expansion of production, with a descending scale as production increases. The problem of sales has not been decided. Until the Central Bank took over in 1952, the copper companies had been able to handle sales on the world market through their own agencies.

MEXICO—The *Mazapil Copper Company* is reportedly intensively working mines at Estacion Camacho, Zacatecas, under lease from Oscar P. Strozzi who discovered rich silver-lead deposits in them. Mazapil's main operation is a copper mine at Concepcion del Oro and its Acasio unit at Durango.

SURINAM—*Reynolds Surinam Mining Corporation*, subsidiary of *Reynolds Metals Company*, has applied for a conversion of its prospecting license of Onverwacht and Mijn Hulp into a concession grant. Bauxite exports for 1953 totaled 3,276,500 metric tons, compared with 3,155,000 tons in 1952. This production came from the following properties: *Moengo* with 1,947,500 metric tons; *Paranam* with 581,500 metric tons; and *Onverdacht* with 747,500 metric tons.

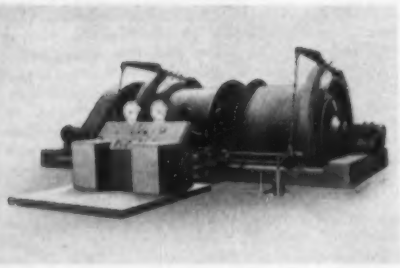
BRAZIL—In 1953, the *Companhia Vale do Rio Doce* exported 1,383,736 metric tons of iron ore. Since 1942 the firm has exported about 6,400,000 metric tons of iron ore. In December 1953, the company transported 6,900 metric tons in the United States using a Brazilian vessel. Previously the company had only been using foreign ships.

CHILE—United States owned properties in Chile produced 327,684 metric tons of copper during 1953, compared with 373,856 metric tons in 1952. Of this amount, *Chuquicamata (Chile Exploration Company)* produced 157,996 tons; *Potrerillos (Andes Copper Mining Company)* 41,473 tons; and *El Teniente (Braden Copper Company)* 128,215 tons.

MEXICO—The Mining Stimulation Commission is arranging for revival of operations of the gold-silver *Padre Flores* and *Dolores Trompeta* mines in San Luis Potosi. Work there was abandoned in 1903 because the steam pumps of that day could not keep the mine dry. With modern methods, the Commission believes that it can unwater the mines and keep them in workable condition.

PERU—Mineral-bearing land in the Pampacolca region of Castilla Province,

Vulcan-Denver



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Department of Arequipa, is reported to be rich in uranium. Messrs. Allan C. Davies and Max Voisin are said to be interested in the property which they estimate contains radioactive rock with a uranium content ranging from 0.15 percent to 1.0 percent.

SURINAM—A prospecting license for manganese ore has been granted to *African Manganese Company, Ltd.* covering some 39,000 acres near the Paramaribo-Kabel railroad and about 45 miles south of Paramaribo.

BRAZIL—According to latest studies approved by the Department of Mines, the Brazilian reserves of manganese ore in the Territory of Amapa are estimated to be 10,663,000 metric tons. The ore contains from 46 to 56 percent Mn, and is distributed through the following deposits: *Curaca* 3,500,000 metric tons; *Ackerman* 1,500,000; *Macacos* 1,170,000 (of this 960,000 metric tons contain 53 precent Mn); and *Chumbo* 1,403,000 tons. In some places, the ore cropped out and extended to a depth of 50 meters. At the *Terezin 6* deposit, an inclined drill hole cut a 75-meter thickness of ore with an Mn content from 50 to 56 percent. About 500,000 metric tons will be exported annually.

MEXICO—Silver-lead mines at Pabillo near Galeana, Neuvo Leon, are reported to have increased production. The owners, Ing. Natividad Ruelas and Eusebio Luna, are building a road to provide better transportation between the properties and Linares, important rail and distribution center.

ARGENTINA—A shipment of 10,000 tons of cast iron from the Soviet Union has been delivered to Argentina. This is the first delivery under a trade agreement signed last year, whereby Argentina would export meat, fats, and other foodstuffs in return for the pig iron.

SURINAM—The *Baker Company* is reported to be showing some interest in platinum deposits near the upper Marowijne River.

JAPAN—Copper, lead, and zinc production reached its peak month since World War II with the output reported for December 1953. Figures were: electrolytic copper 9,303 metric tons; electrolytic lead 2,037 metric tons; electrolytic zinc 5,225 metric tons; and distilled zinc 2,192 metric tons. The increased production is attributed to the wage strike in November which brought increasing demand by manufacturers.

INDIA—*Travancore Titanium Products Ltd.*, the only titanium oxide producer in India, has resumed production after being closed down from the middle of 1952. The plant had been in operation for only nine months when lack of domestic demand for its output necessitated its closure. The Indian government has loaned the firm 1,500,000 rupees to help it reopen. Capacity is about 1,800 tons per year, with only about 600 tons absorbed by the local market.

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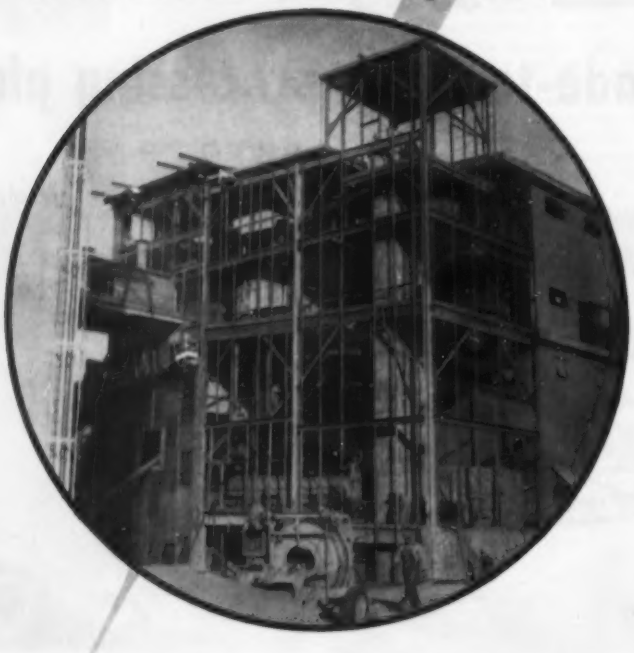

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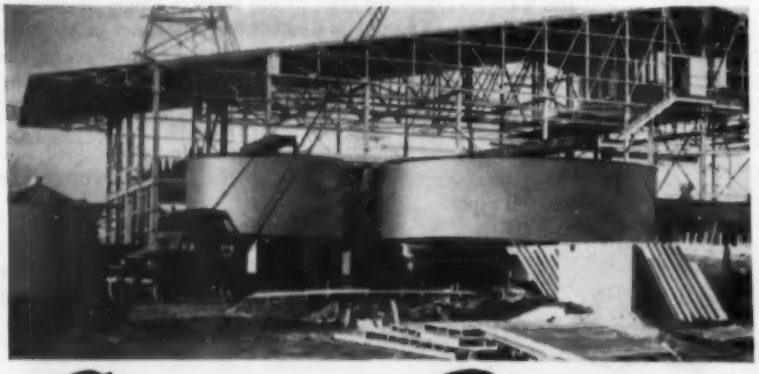

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search and Exploration Institute is reported to have discovered a wolframite deposit in the region of Marmara.

MALAYA—Drilling operations on land to the south of that currently being worked by *Ayer Hitam Tin Dredging Ltd.* near Kuala Lumpur has revealed the existence of low-grade deep ground. It will be some time before the extent of the deposit can be estimated since the rate of drilling in deep swampy ground is slow, but with improved security conditions the firm expects to be able to proceed without interruptions. The remaining life of the high-grade ground ahead of the dredge is about 17 years. This is based on the present capacity of the dredge.

JAPAN—A new firm, the *Musa Mining Company*, has been formed by important rayon pulp and metal interests to develop a sulphur deposit in the northern part of Nemuro, Hokkaido. The companies involved are *Kokusaku Pulp, Mitsubishi Rayon, Teikoku Rayon, Ryoka Sangyo, Mitsubishi Metal Mining Company*, and *Nemura Kogyo Companies*. The sulphur deposit is of volcanic origin. It will be developed by open-pit mining and the sulphur rock will be refined by the Masobello process. The plant is rated at 18,000 tons per annum of refined sulphur. Road and rail transport facilities are being completed and the plant is expected to be installed by mid-1954.

INDIA—After reviewing the chrome ore situation in the country, the Indian government has decided to permit the export of 15,000 tons of chrome ore regardless of grade, during the January to June period of 1954. Exports will be allowed by established shippers and mine-owners with ready stocks. Allotments will be made to established shippers on the basis of 100 percent of half of their best year's exports during any one of four financial years ending March 1953.

CHINA—The Soviet government reportedly will assist Communist China in enlarging its tin plant at Kokiu in Yunnan Province. The specific capacity of the plant has not been substantiated. Reports speculate that the plant will produce anywhere from 4,000 tons to 20,000 tons. The International Tin Study Group, however, recently estimated that China's tin metal production for 10 months in 1953 was about 5,250 tons (or an annual rate of 6,300 tons).

MALAYA—Twenty Chinese-owned mines, including one gold mine, started production in Perak during November. Against this six mines were closed. According to the Labor Department, this was the highest number of mines opened in the state in the past six months.

HONG KONG—The *Nittetsu Mining Company* of Japan has signed a contract with the *Mutual Trust Company* of Hong Kong to develop the iron mines of *Maan Shan* on the Kowloon Peninsula. Nittetsu will lease the machinery and equipment to develop the mines and will be guaranteed 120,000 tons of iron ore annually from the mines for delivery to the *Yawata Steel Works* in Kyushu (southern Japan).

JAPAN—More than 10,000 tons of magnesia clinker have been imported from Red China since last June. The latest shipment of 3,500 tons was sent to *Toho Shokai K.K.*

MALAYA—Several of the state governments are reluctant to approve mining leases because they fear that once the land is mined it will be useless for many years. Most tin mining separates the clay from

the soil and leaves tailing on which little can grow. The Forestry Department of the Federation government is considering the possibility of growing trees on tailing and will consult with an expert on the subject. Meanwhile, others are urging that a comprehensive map be prepared for Kuala Lumpur and other areas where mines have to compete with urban and agricultural interests. If such a map would indicate where tin is or is likely to be, houses would not be built there until all of the tin had been mined out.

PAKISTAN—Good progress continues to be made by the country's mining industry, according to recently issued government statistics comparing output in the first half of 1953 with that of 1952. Chromite output was 11,129.25 tons, compared with 9,368 tons in 1952; limestone went up from 333,899 tons to 411,847 tons, most of which came from Punjab; gypsum was the only mineral to show a decrease, from 13,753 tons in 1952 to 12,469 tons in 1953. Over 10,000 tons of gypsum came from Punjab and the remainder from Sind. Mining of ochres, still in the initial stages, produced 186 tons in the first half of 1953.

INDIA—The Geological Survey of India reports that about 500,000 tons of manganese ore are available in deposits in the North Kanara district of Bombay State. Because of the hilly and thickly wooded location, most of the deposits are difficult to reach. The mineral is deposited in pockets and boulders of various sizes, large concentrations of ore being limited in extent. Existing pits in the area show that the ore, when present, is mostly superficial and does not generally extend much below 10 to 13 feet.

MALAY—*Ulu Klang Tin Ltd.* which holds prospecting rights in the Sungei Manik area of South Perak has made arrangements for *Anglo-Malayan Development Ltd.* to conduct test boring operations there. Adequate security will be provided and a camp has already been constructed to accommodate security personnel and the prospecting parties.

INDIA—The Bureau of Mines has made a discovery of gold and radioactive minerals on the eastern coast. The deposits are in a continuous belt from West Bengal to Orissa and are described as "rich" by experts. Considerable drilling will be required before the gold content can be determined, however.

MALAYA—*Renong Tin Dredging Co. Ltd.'s* No. 3 dredge is being rehabilitated to re-dredge old tailings. The project will cost about £36,000 but part of the expense will be offset by war damage compensation. The No. 2 (Rasa) dredge will be shifted when the present selected area of the Western Section of Kuala Kubu will be worked out. This may not be before 1955 but the transfer of the dredge to the Eastern section can at least be done without having to dismantle the dredge.

NEW BRUNSWICK—A second major ore discovery located on ground jointly owned by *St. Joseph Lead Company* and *Anacon Lead Mines* has been combined with the work being done by *Brunswick Mining and Smelting Corporation* in the same area. As a result close to 50,000,000 tons of mill grade zinc-lead-silver ore are indicated by drilling to the 1,000-foot horizon. Immediate plans call for development of both ore bodies—the original Brunswick discovery now known as the Austen Brook and the Anacon-Leadridge—at a rate which will produce 5,000 tons per day. A 4,000- to 6,000-ton concentrator will be constructed to serve both properties. Zinc, lead-silver, and pyrite would be the concentrates produced. Construction of the plant should begin in 1955. The Austen Brook is an open-pit operation; the Anacon-Leadridge is underground with the preliminary shaft to go to a depth of 400 feet. Opening levels will be at 200 and 350 feet. This shaft will provide ore for mill tests and later will serve as a secondary exit when the main shaft is sunk to a depth of 1,500 feet.

BRITISH COLUMBIA—A sustained exploration program by *Cariboo Gold Quartz Mining Company Ltd.* at Wells is enabling the firm to mill about 200 tons of ore daily while adding steadily to stoping areas which can be drawn upon when returns on gold warrant. A newly discovered major ore body in the Rainbow zone has provided two stopes of better-than-average grade gold ore. Electrical geophysical methods are being used in a search for additional limestone replacement ore bodies.

ALASKA—The lower crosscut at the Funter Bay nickel-copper-cobalt deposit has been driven 100 feet into the Mertie lode without reaching the hanging wall. A good grade of mineralization has been contacted in a zone about 45 feet wide, however. Diamond drilling will be used to explore beyond this point.

WASHINGTON—*Pend Oreille Mines and Metals Company* and *American Zinc, Lead and Smelting Company* have asked an application of Seattle City Light Company to build a power dam on the Pend Oreille River at Boundary, Washington. They claim that the dam would flood their riverside operations because of fractures, cavities, and faults in the ore-containing limestone and dolomite rocks.

ONTARIO — *Falconbridge Nickel Mines,, Ltd.* has purchased 300 acres of land on the Welland Ship Canal near Port Colborne for the eventual location of a nickel refinery. The plant will be used to treat pyrrhotetic concentrates. However, a process for this treatment has not yet been completed and until it is the plant will not be built. Most of Falconbridge's nickel is presently refined in Norway.

BRITISH COLUMBIA—A short diamond drill hole into the hanging wall of an exploratory tunnel at the *War Horse* mine near Kimberley has indicated 3 to 5 feet of good grade lead-zinc-silver ore. David E. Watson of Spokane, Washington is treasurer and manager of the operating company, *Thomas Consolidated Mines, Inc.*

YUKON TERRITORY—During the 1953 fiscal year, *United Keno Hill Mines Ltd.* treated 156,684 tons of ore in its mill, produced 139,761 tons of ore from the *Hector* mine, and 16,923 tons from exploration and development work in other mines that the company has under development. At the Hector, the main crosscuts on the 775 and 900 levels reached their objectives. Discovery of wide ore in No. 3 and No. 3A veins on both levels was of major significance. Between the 650 and 775 levels, development to date has indicated 675 tons per vertical foot, averaging 42.8 ounces of silver per ton, 11.4 percent lead, and 12.4 percent zinc. Raises and subcrosscuts show that this ore occurs in two separate veins. Operations at the *Calumet* mine were confined to exploration, mainly on the No. 1 vein.

NORTHWEST TERRITORIES—For the year ended December 31, 1953, *Giant Yellowknife Gold Mines Ltd.* milled 137,141 tons to recover 91,981,531 ounces of

Shaft Sinking Progresses Near Hudson Bay

Remote Rankin Inlet, in the Northwest Territories of Canada, 300 air miles north of Fort Churchill, Manitoba, has been the scene of intensive development work by Rankin Inlet Nickel Mines Ltd. since 1951. The property is a nickel-copper-platinum prospect of 46 claims, with a lease on 14 adjacent claims. Shaft sinking started last June and as of December 1 was down 109 feet. The objective is 300 feet with two levels established and crosscutting and drifting to follow. Shipments of 1,500 tons of mine equipment and supplies, including prefabricated buildings, fuel oil, Diesels, caterpillar trucks, a Snowmobile, and 50 tons of dynamite, were successfully landed at Rankin Inlet in August 1953. The photograph at left shows the unloading operation. The men on shore (with backs to the breeze) are waiting to unload the explosives on to "skids." The photograph at right shows the hoist and compressor building, headframe, and machine shop/garage building. The lowest temperature recorded as of January 16 at the property was —52.8° F. K. C. Wilson is manager of the operation; A. K. Roberts is president of the firm.

gold and 18,172.71 ounces of silver. Net profit for the year was $958,705.14 compared with $421,177.83 in 1952 when 70,021 tons of ore were milled to recover 44,320.454 ounces of gild and 7,363.79 ounces of silver.

ALASKA—Copper mineralization has been uncovered in various places along the new road being constructed from Paxson's westward toward Mt. McKinley, making the general area appear promising. The McLaren River prospect was discovered in this region last summer.

UTAH—*Homestake Mining Company* has concluded negotiations to purchase all of the capital stock of the *Little Beaver Mining Company, Inc.* which owns several uranium claims near Moab, Utah.

ONTARIO—The *International Nickel Company of Canada, Ltd.* has placed a tonnage oxygen unit in operation for the production of vast quantities of oxygen required for the direct flash-smelting of copper concentrates. The new process eliminates the fuel normally required for smelting and makes the present large-scale output of liquid sulphur dioxide by *Canadian Industries Limited* more economical. Leading research scientists have found that oxygen employed in tonnage volumes will transform many present industrial processes within the next generation and International Nickel is one of the leaders pointing the way. The far-reaching possibilities of large-scale oxygen applications will particularly affect the metallurgical and chemical industries.

BRITISH COLUMBIA—During 1953, *Bralorne Mines Ltd.* milled 183,168 dry tons of ore to recover 70,168 ounces of gold. The relatively large amount of preparatory work for the Queen shaft is nearly completed, and sinking has started. The program of finishing stopes on the upper levels is well advanced. Some of these were low grade, thus reducing the value of the mill feed.

COLORADO—Graduates of the Colorado School of Mines who have at least two years' working experience in mineral engineering have an opportunity to apply for a two-year fellowship at the Harvard Business School. Financial support for the program has come from 11 mining executives interested in the School of Mines. The fellowship will lead to a master's degree in business administration and carries a $1,500 per year grant-in-aid.

YUKON TERRITORY—*Cassiar Asbestostos Corporation* expects that mill construction will be completed and necessary equipment installed in sufficient time to place the 500-ton milling unit in operation by June 1954. The mill has been designed to permit expansion to a larger capacity with a relatively small additional capital expenditure. An aerial tramway to provide transportation between the mine and the mill has been placed on order and is expected to be in operation by the end of September. The tram will have a capacity of 100 tons of ore per hour and it is expected that this installation will materially extend the effective mining season.

BRITISH COLUMBIA—While awaiting improvment in base metal prices to put its Kaslo district property into production, *Jackson Basin Mining Company* is going ahead with exploration of the recently optioned *Judy* uranium prospect 12 miles north of Uranium, Lake Athabaska area, Saskatchewan. *Crown Silver Lead Mines, Ltd.* with a base metal property north of Hazelton, B.C., has been granted authority to change its name to *Crown Silver Development Ltd.* It has acquired interests in western Canada oil development and in an Oregon gold mine called the *Alameda*.

QUEBEC—*Ascot Metals Corporation* has started a program to broaden its search for both nickel and copper deposits in the *Eastern Metals Corporation* area 60 miles southeast of Quebec City. Cross sectional diamond drilling will explore favorable ground indicated by strong magnetic anomalies similar in intensity and contour to those in which Eastern Metals discovered its ore bodies.

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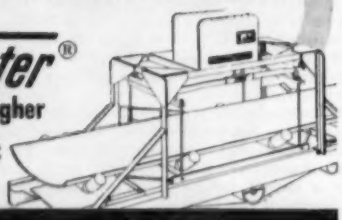

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UNION OF SOUTH AFRICA—*Rustenburg Platinum Mines* plans to expand the flotation sections of both its Rustenburg and Union reduction and concentrating plants. The present combined capacity of these plants is about 125,000 tons per month. The additions to the flotation circuits are expected to improve the extrac-

tion. Sinking of a shaft at the Rustenburg Section to the deeper levels of the mine also has started. Operation of the smelter plant being erected at Rustenburg for the preliminary treatment of part of the increased output of matte is now likely to get underway soon. This plant will be operated by *Matte Smelters Pty, Ltd.* which is jointly owned by Rustenburg and the *Johnson Matthey Company* of Great Britain.

ANGOLA—An exclusive mineral concession has been granted by the Portuguese government to the *Sociedade Mineira de Lombige* in Angola. The concession covers an area of approximately 57,000 square kilometers and adjoins in the mineral concession of the *Companhia Mineira de Lobito*. The government of Angola has a 10 percent interest in the company. A total of £48,600 has to be spent on prospecting work during a period of three years. The concession lies to the east of Sa de Bandeira in the area of Quipungo and Vila de Ponte. The area contains several copper and gold deposits.

SOUTHERN RHODESIA—The first of two small consignments of pig iron from the *Rhodesian Iron and Steel Commission's* works (RISCOM) at Que Que has been shipped to Los Angeles and Philadelphia. Following an intensive diamond drilling exploratory and development program on RISCOM's north and central ore bodies at Que Que, a second blast furnace has been erected and will start production early this year. After satisfying the requirements in the federal territories —Southern and Northern Rhodesias and Nyasaland—a surplus of 25,000 to 40,000 tons will be available yearly for exports to the United States and the Far East markets, particularly to Bangkok, Karachi, and Bombay.

NIGERIA—*Jantar Nigeria Company, Ltd.* will sink a shaft and drive a drainage adit 600 feet under the Basalt Lead by September of this year. If the extraction of gravel is found to be possible, tin production will then start. By September, too, it is expected that a new pump will have been installed which will make working of the columbite areas and the new treatment plant much easier. The absence of adequate equipment in the past has been a great handicap and up to September 1953 production was only 108 tons of columbite out of a total of 210 tons qualified for the 100 percent columbite bonus which the United States Defense Materials Procurement Agency pays on the basic price of £1,051 per ton provided the concentrate assays 65 percent.

UNION OF SOUTH AFRICA—As a result of output from the new gold producers in the Transvaal and Orange Free State, production of gold in South Africa through the first 11 months of 1953 amounted to 10,915,210 fine ounces, This represented a slightly higher annual rate than that of 1952, the total for which was 11,815,512 fine ounces. These totals included the miscellaneous output of mines outside the Rand and Free State fields. Excluding miscellaneous production, the major mines of the Rand and its extensions in the Transvaal milled 52,010,800 tons in the 11 months of 1953, compared with 58,794,500 tons in the full year of 1952. Three additional Free State mines began production in 1953, and this was the main factor in the increase of tonnage milled to 1,879,000 tons from the 1952 figure of 1,206,000 tons. Because of the early stages of the Free State operations, the returns for the Free State field are hardly comparative. However, the two Free States mines—*St. Helena* and *Welkom*—that milled 1,206,000 tons in 1952, treated 1,417,500 tons in the first 11 months of 1953.

SOUTHERN RHODESIA—The *London & Rhodesia Mining & Land Co., Ltd.* has acquired, through a subsidiary company *Mazoe Consolidated Mines Ltd.*, the *Bucks* gold mine near Salisbury for £80,000 ($224,000). Originally owned by A. W. Winter, the mine was intensively developed in depth on a small operator's scale. The property consists of 73 gold claims, each with an area of 90,000 square feet. The mine is located close to the *Connaught* mine, a narrow gold vein, which has been successfully mined by the group for a number of years.

SOUTH WEST AFRICA—Since the recent commissioning of its new mill, *Uis Tin Mining Company* is now operating on a profitable basis. The throughput of ore is steadily being raised toward full capacity of 1,000 tons per day. November output was 30.4 long tons of tin concentrate. The company has installed a Dings magnetic separator for recovering the tantalite-columbite from the tin concentrate. Extraction is reported as satisfactory.

NORTHERN RHODESIA—*Rhokana Corporation Ltd.* has erected a pilot plant at Nkana in order to investigate the possibilities of extracting uranium from the ore body in the Mindola Section of the mine. The plant is being operated by an associated company. As the name suggests, the Rhoanglo Mine Services specializes in the kind of service which is now required of it—that is, finding out whether uranium can be obtained in sufficient quantities to make its production a commercial proposition.

UNION OF SOUTH AFRICA—The Transvaal Chamber of Mines has changed its name to Transvaal and Orange Free State Chamber of Mines in order to indicate the enlarged field of operations that its member companies now participate in.

UGANDA—*Tororo Exploration Company, Ltd.* has completed its detailed drilling on the *Sukulu* deposits at Tororo. The existence of over 200,000,000 tons of soil containing workable amounts of apatite and pyrochlore was indicated by the drilling program. The company is presently considering the advisability of erection of a treatment plant which would produce apatite concentrates for manufacture of chemicals and fertilizers. It is estimated that about 100,000 tons of apatite and about 1,000,000 pounds of columbium pentoxide could be recovered annually. *Monsanto Chemicals Ltd., Rio Tinto Company, Frobisher Ltd.*, and *Uganda Development Corporation Ltd.* formed the company to explore the district for its mineral wealth. (See MINING WORLD, September 1953, page 71.)

SOUTHERN RHODESIA—*Coronation Syndicate Ltd.* has completed erection of a modern 2,500-ton-per-month mill at the *Muriel* mine. Developments on the 13th level proved the gold-bearing ore shoot averaging 15.1 dwts. over a 38-inch width. The ore body is a narrow 2- to 3-foot-wide quartz vein mineralized with free gold-bearing chalcopyrite, embedded in a narrow belt of basement schists, near the Great Dyke. The flotation copper-gold concentrates are treated by a smelter in the United States. Coronation Syndicate also operates the *Arcturus, Butterfly*, and *Tebekwe* gold mines in Southern Rhodesia.

New HMS Plant Treats Rhodesian Chrome

Rhodesia Chrome Mines Ltd. has started operation of its new heavy media separation plant at the Peak mine (shown above), located near Selukwe in Southern Rhodesia. This is reported to be the world's second HMS plant to treat chrome. The first was that of the Benguet Consolidated Mining Company at Masinloc in the Zambales Mountains of western Luzon, Philippine Islands, which was described in the July 1953 issue of MINING WORLD, pp. 46, 47. High-grade coarse metallurgical chrome concentrate is now being produced, with ferro-silicon used as the heavy media. The company has been in operation since 1908 and today is reported to be Rhodesia's largest chrome producer with an output of about 15,000 tons of chrome ore per month. The company is associated with African Chrome Mines Ltd., the second largest producer in the country. General manager and consulting engineer of both firms in Africa is G. H. Parkinson.

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UNION OF SOUTH AFRICA—The chairman of the *Rand Selection Corporation Ltd.* of the *Anglo American* group has stated that all the mines in the Orange Free State have now reached the underground development stage; that by the end of 1954 the major task of opening up the new gold field will have been completed; and that nine mines will probably be in production. This means that four Free State mines will probably enter their production stage in 1954, in addition to the five already producing. These four are likely to be *Virginia, Harmony, President Brand,* and *President Steyn.* So far, 13 mines have been established in the Orange Free State gold field, a fourteenth is probable, and an additional two or three are possible.

SOUTHERN RHODESIA—A use for jet piercing is reported in Southern Rhodesia. Oxygen lance jet-piercing is now being used in development work at the *O'Brians* prospect mine on massive corundum ore (Al_2O_3) which is extremely hard. Production has been increased to 400 tons monthly. The lumpy ore is being exported to South Africa for the requirements of the *Consolidated Rand, Brick, Pottery & Lime Company* for manufacture of highly refractory bricks required by the Northern Rhodesian copperbelt smelters. Geologically, the massive corundum zone lies between greenstones and ferruginous quartzite in a metamorphic belt. Development is under the supervision of M. F. Haddon, a consulting engineer of Salisbury.

UNION OF SOUTH AFRICA—The underground connection between Nos. 1 and 2 shafts of the *Virginia Orange Free State Gold Mining Company, Ltd.'s Virginia* gold-uranium mine has been completed. The legal restrictions on single entry workings involving underground personnel has now been removed and expansion of operations can be expected, provided labor is available. The gold reduction plant will be ready for production shortly at an initial rate of 50,000 tons per month. An increase in this rate to 75,000 tons is expected by the end of the year. Erection of the uranium and sulphuric acid plants has started. The latter should be in operation by the third quarter of this year, and the former early in 1955. Estimated cost of both is about £4,250,000 which is being provided by the United States and British governments.

SOUTHERN RHODESIA—The *Cam & Motor Gold Mining Company (1919) Ltd.* increased the profit for the financial year ended 1953 by £100,000 to £431,043. A total of 285,500 tons of ore were milled during the year with an average recovery of 5.3 dwts. per ton milled. Development is now being carried out on the 40th level of the mine, 5,600 feet below the surface in a temperature of 110° F. The present developed ore reserves are computed at 1,400,000 tons containing 6.6 dwts. gold. Large-scale exploratory underground diamond drilling of a new ore body was continued with encouraging results. In order to increase recovery, a new flotation plant is now under construction. The mine employs 1,800 Natives. It has been in production since 1909. The ore bodies lie in the archaean schist belt of Gatooma, consisting of doleritic and calcareous greenstone and sedimentary series. The three main ore bodies are the Cam, Motor, and Petrol lodes.

UNION OF SOUTH AFRICA—The *Associated Manganese Mines Company* has successfully concluded its negotiations with *Manganese Corporation Limited* for the acquisition from the latter of its rights in the Postmasburg area of the Northern Cape. The sum involved was £480,000. Associated Manganese now holds the freehold, mineral rights, and long-term mining leases over farms totaling about 110,498 acres. These titles also cover the rights to base metals other than manganese, including some of the richest iron ore deposits in South Africa. The company also retains a lease from the South African government for manganese ore in the area known as "Black Rock," as well as a lease expiring in 1960 over the farm Gloucester. Extension of this lease is being negotiated.

AUSTRIA—*Aluminum A.G.* of Ranshofen plans to produce 42,000 metric tons of aluminum during 1954, a level only 8,000 tons short of production capacity. The production is entirely dependent upon the amount of electric current available for the operation.

BELGIUM—The International Conference on Complete Gasification of Mined Coal will be held in Liege May 3 through 8, 1954, under the auspices of the *Institut National de l'Industrie Charbonniere (Inichar)*. All reports and discussions will be in three languages—French, English, and German. Reports from the United States will be presented by Dr. L. L. Newman of the U. S. Bureau of Mines who will discuss "Developments in the Oxygen Gasification of Solid Fuels on the American Continent," and Dr. H. W. Nelson of Battelle Memorial Institute who will discuss "Problems in the Complete Gasification of Caking Bituminous Coals."

NORWAY—A/S *Sydvaranger* is reported to have sold most of its planned 1954 output, totaling about 800,000 tons. Principal buyer is Western Germany, with some shipments going to Belgium and Great Britain. Prices are said to be lower than in 1953 when the value of iron ore exported from Sydvaranger was about £3,500,000.

FRANCE—Two additional consignments of manganese ore from the Soviet Union have arrived in Boulogne recently. These are in addition to the 2,000 tons which arrived earlier.

GREAT BRITAIN—A record 17,609,000 long tons of steel were poured in 1953 from British steel mills, compared with 16,418,000 tons produced in the 53 weeks of the previous year. The increase of 1,191,000 tons would be closer to 1,500,000 tons if only 52 weeks of 1952 are considered. Additional capacity will permit a greater increase in 1954 if demand warrants it.

YUGOSLAVIA—At the *Brasina* antimony mine, near the Drina River, a new concentrator has been erected, with much of the equipment coming from Denver, Colorado. Coarse and sand jigs, Wilfley tables, and flotation cells have been installed. Gravity concentrates are averaging between 10 and 35 percent Sb and flotation concentrates 50 to 55 percent Sb. The *Brasina, Padjine, Mamutovac,* and *Zavorje* mines deliver their ore to this plant. A new 8 kilometer tramway connects the plant with the smelter at Zajaca, at present the only one in operation. Further southeast, near Krupanj, the *Dobri, Potok,* and *Stolice* mines each have their own flotation plants. Their concentrates averaging between 40 and 60 percent Sb are delivered to Zajaca, a distance of 40 miles by road. Also delivered to Zajaca, by train, are rich concentrates averaging 60 to 65 percent Sb from the *Bujanovac* mine. In 1952, Yugoslavia produced 1,329 tons of antimony; in 1953 production was approximately 1,400 tons. It is expected that there will be an increase of 15 percent in 1954.

SWITZERLAND—Exports of Swiss iron ore in 1953 are expected to rise above the 1952 level of 11,060 tons. An all-time high of 205,210 metric tons is estimated for 1953. West Germany and Austria bought the 1952 output.

AUSTRIA—November's mining production was reported as follows: 224,513 tons iron ore; 10,064 metric tons lead-zinc ore; 15,560 tons copper ore; 2,533 tons bauxite; 984 tons antimony ore; and 64,748 tons magnesite. All of these are below the average 1953 production level, caused by bad weather conditions. Styria Province alone supplied 207,810 metric tons of iron ore and 37,400 tons of magnesite.

ITALY—*Metal-Nova Company,* a producer of electrolytic copper, is building a copper refinery in Southern Italy which reportedly will be the only one of its type in that part of the country. Initial production will be at the rate of one ton of cathodes a day.

ENGLAND—*Mineral Recovery Ltd.* continues to operate its plant near Camborne where tin-bearing beach sands from the nearby seashore are treated for tin recovery. The sand carries about 0.7 percent Sn. It is brought by truck to the plant where it is roughed on tables, rejecting a small tailing and separating a small concentrate. A large middling is sent to a ball mill for fine grinding because most of the cassiterite is not liberated in the sand as found on the beach. After grinding and classification in a Stokes Hydrosizer, concentration takes place on Holman sand and slime tables. Slime overflow is dealt with by concrete slime frames making a low grade concentrate which is shipped to the smelters.

FRANCE—*Pechiney (Compagnie de Produits Chimiques et Electrometallurgiques)* increased its aluminum production during the first nine months of 1953 to 69,330 tons, compared with 68,470 tons in the same period of 1952.

HUNGARY—Shortcomings in the supply of iron ore to the Zahony ore center have been reported. Soviet iron ores, arriving in wide-track (Soviet gauge) railroad cars, are dumping into Hungarian (normal track) railroad cars without any grading or cleaning being done. The blast furnaces, therefore, are complaining about the greatly varying quality and size of the shipments, which make an even production quality impossible and slow down operations, thus creating excess costs for the mills. The Zahony station serves as the major ore center for Hungary. Soviet 60-ton capacity cars bring the ore to the Hungarian furnaces because the domestic production of ore is insufficient in regard to the steeply boosted iron and steel mills' capacity.

ITALY—The Italian Ministry of Foreign Trade has released the list of goods which Italians will be permitted to import and export from and to the Soviet Union with and without license. Included on the import list, not requiring a license, are 25,000 tons of manganese ore, 15,000 tons of chrome ore, and 3,000 tons of asbestos.

FRANCE—*Intercontinental Clearing* has enlarged its offices and facilities at 29, Rue des Pyramides, Paris. The firm acts as a contractor, importer, and distributor of heavy engineering and industrial equipment into France, Germany, and Africa for Canadian and United States manufacturers. Among the services the firm offers are preparation of European and African markets surveys, handling of all European correspondence, general representation of a member's industrial interest on the European and African continent, office space, and secretarial service.

Finnish Nonmetallic Mining Operations

Suomen Mineraali Oy of Helsinki is Finland's largest nonmetallic mining firm. The pictures above were taken at two of the firm's numerous operations: (left) the talc mill at Paltamo with an annual output of 6,000 tons, and (right) the diatomite excavation at Komu-morass. In addition to its talc and diatomite production, Suomen Mineraali is the country's only asbestos producer, with a plant located at Maimi. About one-half of the output is exported. Another important export for the firm is feldspar. In 1952, its feldspar production was about 10,000 tons. A feldspar mill is operated in conjunction with the asbestos plant at Maimi.

SOUTH AUSTRALIA—Lumps of pitchblende containing 70 percent uranium oxide have been found on the surface at Wild Dog Valley only 40 miles from Adelaide. The South Australian government has paid an initial reward of £A5,000 to the discoverers. The government has also reserved the mineral rights over a large area. The deposits have been described by geologists as massive resinous-looking pitchblende. S. B. Dickinson, director of mines, states that there may be a well-defined lode of pitchblende at depth. The valley is near Myponga where rail transportation is available and a water supply program is well advanced.

PHILIPPINE ISLANDS—*Benguet Consolidated Mining Company* is planning to expand its 2,900-ton-daily-capacity gold mill at Balatoc near Baguio to 4,000 tons. The increased tonnage, together with cooperation of employes, will cut down the average cost per ton and allow the company to operate at a profit, says Judge J. W. Hausserman, president of the firm. He praised the government for easing the mining industry of much of its burden with the abolition of several taxes.

TASMANIA—*Renison Associated Tin Mines N.L.* has located very high grade ore at North Dundas. A sulphide body 54 feet wide had shown six feet of 6.2 percent Sn and two feet of 21.7 percent. Significance of these is not yet revealed but the Renison tin ore body is Australia's largest and some geologists believe that another Mount Bischoff may yet result from discoveries there. American interests have decided not to proceed with plans to buy the leases due to the fact that Australian taxation authorities would not permit a tax-free sale.

NORTHERN TERRITORY—*Peko (Tennant Creek) Gold Mines N.L.* has doubled its capital in order to increase treatment capacity to 100 tons per day. The concentrator is approaching completion. Initially, a high-grade copper concentrate carrying gold will be dispatched to the custom smelter at Port Kembla, New South Wales. Another promising Territory copper producer, *Home of Bullion Mines Pty. Ltd.*, at Barrow Creek, is temporarily idle, transportation costs having made ore shipments uneconomical. Also at Tennant Creek, *Northern Star (Tennant Creek) Gold Mines N.L.* has decided to cease production of gold because of a decline in ore grade and fixed gold price. Results of drilling by *Northern Mines Development N.L.* did not appear to promise discovery of ore bodies.

PHILIPPINE ISLANDS—*Consolidated Mines, Inc.* has demanded payment of over 1,000,000 pesos from *Benguet Consolidated Mining Company*. This represents 50 percent of excess receipts from the sales of chrome ore from Consolidated's *Masinloc* mines in Zambales during a five-month period from July to November 1953. Consolidated is pressing its court suit against Benguet in a supplemental complaint to an original complaint which charges that Benguet's 50-year term of existence as a "sociedad anonima" expired as of June 24, 1953.

INDONESIA—December tin production from Indonesia was 3,146 tons. Total production for 1953 was 33,753 tons, compared with 35,003 tons in 1952, and 30,986 tons in 1951.

NEW SOUTH WALES—A party from the geological survey branch of the New South Wales Department of Mines has investigated radioactive deposits at Torinton, near Glen Innes. A number of leases have been pegged by interested parties. Melbourne interests have made a survey of part of the area and statements have been made that uranium is present in commercial quantities. In view of the present depressed base metal prices, particular interests will be taken in uranium in this part of the state.

PHILIPPINE ISLANDS—At *Baguio Gold Mining Company*, the lower-than-normal tonnage milled, for the second month, was caused by excessive slimes. To correct this condition and to insure cleaner and more economical handling of the ore, it has been decided to install a washing plant. A new Telsmith crusher and a Dorr duplex heavy-duty drag classifier will be installed and connected with the mill through the use of conveyor belting. At the same time, to take advantage of extra capacity in the crusher and filter units, two new tray thickeners, each 30 feet by 15 feet, will be added to

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Hardinge Bulletin AH-449-3 describes this new classifier in detail.

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VICTORIA—A newly registered company in Melbourne, which will begin mining operations for rare metals, has been guaranteed high prices and has an open contract with the United States government for all ore produced for a three-year period. The firm is *Northwest Tantalum Ltd.* It proposes to develop uranium ores which are stated to exist on its leases, as well as to mine for tantalum, columbium, beryllium, caesium, and other rare metals. Directors estimate that continuous production will begin within six months.

PHILIPPINE ISLANDS—*General Base Metals, Inc.*, the country's largest manganese producer, reports that prospects for this year are much better than they have been in the past. The company's present sales contract which expires this month is to be the largest ever granted to only one buyer, says the firm. A still larger contract is now being negotiated. Testing of the firm's properties in Bohol began in August 1953, under the supervision of the United States Geological Survey and the Philippine Bureau of Mines. The experimental program on the company's properties has developed approximately 1,300,000 tons of manganese ores of all grades. About 200,000 tons of these ores can be treated for upgrading to shipping grade in the present washing plants of the company.

TASMANIA—*Mount Lyell Mining and Railway Company Ltd.* at Queenstown is installing extra concentrating equipment to increase capacity to 2,000,000 tons per year. This is a 25 percent increase in what is already the largest single concentrator in Australia. The program, which also involves larger scale open-pit mining, may take three to four years. Since the war, there has been continual expansion at Mt. Lyell. Main handling units are now 5-cubic-yard shovels and 20-ton Euclid trucks feeding an 84-inch by 60-inch Allis-Chalmers jaw crusher for primary crushing.

PHILIPPINE ISLANDS—*Atlas Consolidated Mining and Development Corporation* has signed a three-year agreement with the *Mitsubishi Metal Mining Company* of Japan for the sale of copper concentrates from the *Toledo* mine in Cebu. (See MINING WORLD, January 1954, page 63.) The contract, in addition to being a sales agreement for the concentrates, involves an advance payment of Pesos 750,000 in the form of equipment and aid in developing the mine. Estimated cost of putting the property into production is Pesos 7,500,000. The mill is expected to be in operation by the middle of the year, and will be the largest copper concentrator in the Far East.

TASMANIA—In the year ended October 31, 1953, output of *King Island Scheelite (1947) Ltd.* at King Island increased to 77,929 units against 60,606 for the previous year. The 5,000-tons-per-week mining goal has been reached. In addition, 20,000 tons of overburden are removed weekly.

NEW SOUTH WALES—*Tungsten Consolidated Ltd.* at Frogmore has restricted production because of the decline in wolframite prices. *Rye Park Scheelite*, an associated company, at Boorowa, has had further magnetometric surveys undertaken by the Commonwealth Bureau of Mineral Resources.

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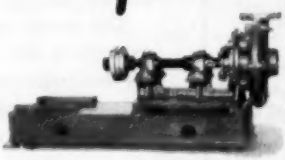

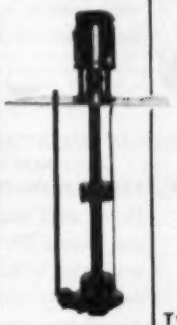

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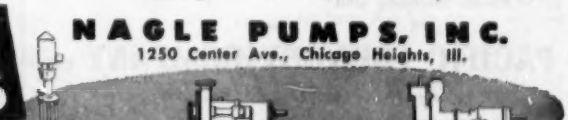

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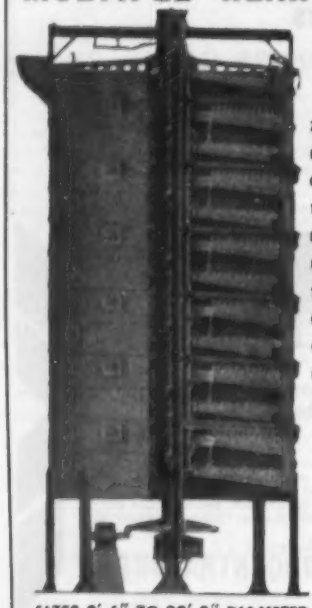

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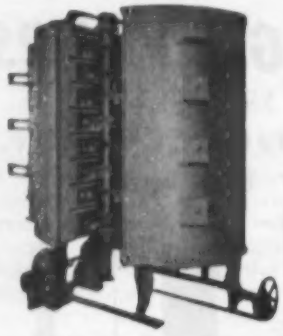

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ENGINEERING BOOKS:

Views and Reviews

TUNGSTEN—ITS METALLURGY, PROPERTIES, AND APPLICATIONS. By J. Smithells. The Chemical Publishing Company, Inc., New York. 225 illustrations and numerous tables. $8.50.

This is one of the most comprehensive books in the English language on the metallurgy, chemical and physical properties, and industrial applications of tungsten.

The introductory section outlines the mineralogy of this important metal. The primary and secondary raw materials, their step-by-step treatment for the production of metallic tungsten, the working of tungsten for obtaining various ductile products, the metallographic structure of the pure metal, the influence of manufacturing operations on the physical properties of tungsten, the most important tungsten alloys and their industrial applications, chemical and spectrographic methods for the determination of impurities are among the many topics discussed in detail. The author enlisted the help of several experts in writing the chapters on the special phases of the subject.

PLANT LOCATION. By Leonard Yassen. Business Reports, Inc. 225 West 34th Street, New York, New York. 195 page study, includes many four color illustrations, numerous charts and diagrams, 8½ by 11 inches, plastic cover. $12.50

Plant Location shows, for the first time, an authoritative and practical presentation of the factors influencing scientific location of new plant facilities in an era in which there are rapid population shifts, growth in numbers, changes in age brackets, shifts in location and in skills. Shifting markets, mounting freight costs, the need for new labor pools and advancements in training techniques are but a few factors which have stimulated the vast decentralization of industry—a major phenomenon of our day.

The study can be of incalculable value not only to executives who are relocating and adding plants, but to all businessmen who measure and constantly re-appraise the competitive advantages or disadvantages under which they operate.

LEAD IN MODERN INDUSTRY, Lead Industries Association, New York, New York. 1952, 230 pp., $1.50.

The book of 28 chapter reviews the history of lead, its production from mine to refined metal, and gives a detailed description of the various techniques for fabricating the metal into useful form. It is a handy reference for all who use lead and its products.

Copies of any of these books may be purchased from *Mining World*, 121 Second Street, San Francisco.

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U.S.A. Metal & Mineral Prices

METALS

February 12, 1954

COPPER:	**Electrolytic.** Delivered F.o.b. cars, Valley basis	30.00¢
	Lake. Delivered, destinations, U.S.A.	30.00¢
	Foreign Copper. Valley basis	29.50-30.00¢
LEAD:	**Common Grade.** New York	13.00¢
ZINC:	**Tri-State Concentrates,** jig, flotation 80% lead, per ton, Eagle-Picher	$159.05
	Prime Western; F.o.b., E. St. Louis	9.50¢
	Prime Western; Delivered, New York	10.00¢
	Tri-State Concentrate, 60% zinc, per ton Eagle-Picher	58.00
ALUMINUM:	**Primary 30 Pound Ingots (90% plus).** F.o.b. shipping points	21.50¢
ANTIMONY:	**Lone Star Brand.** F.o.b. Laredo, in bulk	29.00¢
BISMUTH:	(in ton lots) price per pound	$2.25
CADMIUM:	**Sticks and bars.** 1 to 5 ton lots (Price per pound)	$1.70
COBALT:	**97-99%,** keg of 550 pounds (Price per pound)	$2.60
COLUMBIUM:	**Powder** Nom., per pound	$75.00
MAGNESIUM:	**Ingots (99.8%).** F.o.b. Freeport, Texas	27.00¢
MERCURY:	**Flasks.** Small lots, New York	$189.00-$191.00
NICKEL:	**"F" Ingots (5 pounds).** F.o.b. refinery,, Port Colbourne, Ontario	60.00¢
TIN	**Grade A Brands.** New York (Price per pound) Prompt delivery	85.25¢
TITANIUM:	**99.3%** + (Price per pound)	$5.00
GOLD:	United States Treasury price	$35.00 per ounce
SILVER:	**Newly mined domestic.** United States Treasury price	90½¢ per ounce
	Foreign Handy & Harman	85.25¢ per ounce
PLATINUM:		$90.00-$92.00
ZIRCONIUM:	**Powder,** 100 pound lots, per pound	$7.00

ORES AND CONCENTRATES

BERYLLIUM ORE:	**10 to 12% BeO.** F.o.b. mine, Colorado	$45.00 per unit
	Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at $400.00 per short ton or by assaying at: 8.0 to 8.9% BeO, $40 per unit; 9.0 to 9.9%, $45; over 10.0%, $50.	
CHROME ORE:	F.o.b. railroad cars eastern seaports. Long tons dry weight.	
	African (Rhodesian). 48% Cr_2O_3. 3 to 1 Ratio	$44.00-$46.00
	African (Transvaal). 48% Cr_2O_3. No Ratio	$34.00-$35.00
	Turkish. 48% Cr_2O_3. 3 to 1 chrome-iron ratio	$53.00-$55.00
	U. S. Government ore purchase depot Grants Pass, Oregon. Base price, lumpy ore, $115.00; fines and concentrates $110.00 for 48% Cr_2O_3 and a 3 to 1 chromium-iron ratio. Premiums for higher grade ore and for a ratio up to 3.5 to 1. Penalties for grades down to 42% Cr_2O_3.	
COLUMBIUM-TANTALUM ORE:	At United States small lot beryl purchase depots. $3.40 per pound contained combined pentoxides in 50% ore.	
IRON ORE:	Lake Superior. Per gross ton Lower Lake Ports	
	Mesabi, Non Bessemer, 51.5% Fe. Second quarter	$9.90
	Mesabi, Bessemer, 51.5% Fe. Second quarter	$10.05
	Old Range Non Bessemer. Second quarter	$10.15
	O'd Range Bessemer. Second quarter	$10.10
	Swedish, Atlantic Ports, 60 to 68% Fe, Contracts, Per Unit	22.00¢
MANGANESE ORE:	**Metallurgical grade.** 46 to 48% Mn. Long ton unit	$1.05-$1.07
	Chemical grade. 80% MnO_2. Per ton	$70.00
	Domestic U. S. Government are purchasing depots: Deming, New Mexico; base price $2.30 per long dry ton unit of recoverable manganese less handling and treating costs. Wenden, Arizona; base price of $8.54 per long dry ton of 15% manganese ore. Butte, Montana; (black and pink ores) base price of $4.87 per long dry ton of 18% manganese ore. Phillipsburg, Montana base price of $6.43 per long ton unit of 15% manganese ore. Small lot program f.o.b. railroad cars, minimum 40% Mn. Base price (48%) $2.30 per unit with premiums and penalties.	
MOLYBDENUM CONCENTRATE:	90% MoS_2 F.o.b. Climax, Colorado. Per pound of contained molybdenum, plus cost of containers	$1.00
TUNGSTEN CONCENTRATE:	**Domestic.** 60% WO_3 Per short ton unit	$63.00-$65.00
	Foreign. 65% WO_3 Per short ton unit (Scheelite)	$27.00-$28.00
	Foreign. South American, Spanish, Portugese	$19.00-$20.00
URANIUM ORE:	**Carnotite-Roscoelite.** F.o.b. purchase depot plus $0.06 per ton mile ($6.00 maximum), Grand Junction, Rifle, Durango, Naturita and Uravan, Colorado. Salt Lake City, Marysvale, Thompsons, and Monticello, Utah. Shiprock, New Mexico, Edgemont, S. Dakota. Base price for 0.10% ore is $1.50 per pound and up to $3.50 per pound of contained U_3O_8 plus $0.75 per pound for each pound in excess of 4 pounds per short dry ton and an extra allowance of $0.25 per pound for each in excess of 10 pounds. A $0.50 per pound development allowance paid on all ores purchases. At Shiprock all ores with more than 6% lime are penalized for excess lime.	
VANADIUM ORE:	**Carnotite-Roscoelite.** V_2O_5 in ratio of more than 10 parts to 1 part of U_3O_8 are generally acceptable at all AEC depots, but excess not paid for at Marysvale, Monticello and Shiprock. Per Pound V_2O_5	$0.31

NON-METALLIC MINERALS

BENTONITE:	**Minus-200-mesh.** F.o.b. Wyoming points. Per ton in carload lots	$12.50
	Oil Well grade. Packed in 100 pound paper bags	$14.00
FLUORSPAR:	**Metallurgical grade.** 70% effective CaF_2 content per short ton F.o.b. Illinois- Kentucky mines	$42.50
	Mexican. 70% f.o.b. border	$30.00
	European, Atlantic Ports, 70%	$37.00
	Acid Grade. 97% CaF_2 F.o.b. Kentucky, Illinois, Colorado	$60.00
PERLITE:	**Crude:** F.o.b. mine per short ton	$3.00 to $5.00
	Plaster grades. Crushed and sized. F.o.b. plants	$7.00 to $9.00
SULPHUR:	Long ton, F.o.b. Hoskins Mound, Texas	$25.50
	Export	$30.50

LONDON METAL AND MINERAL PRICES

February 9, 1954

		Per Long Ton	USA Equivalent cents per pound[1]
COPPER:	**Electrolytic, spot**	£229 10s 0d	28.69¢
LEAD:	**Refined, 99.97%**	£82 15s 0d	10.34¢
ZINC:	**Virgin, 98%**	£73 15s 0d	9.22¢
ALUMINUM:	**Ingot, 99.5%**	£156 0s 0d	19.50¢
ANTIMONY:	**Regulus, 99.6%**	£210 0s 0d	26.25¢
TIN:	**Standard, 99.75%**	£652 10s 0d	81.56¢
TUNGSTEN:	**Long ton unit, 160-170s, equivalent to**		$16.80

1. With Sterling pound at $2.80.

Quotations on metals and certain ores through the courtesy of *American Metal Market*, New York, N.Y.

PRODUCTION EQUIPMENT PREVIEW

PEP is just what new equipment, increased mechanization, and new methods can give to your mine, mill, or smelter. This PEP section is MINING WORLD'S way of making available to you some of the finest current information on mechanization.

Conveyor Reversal Stopped By Roller Type Hold-Back

The S-A Enclosed Roller Type Hold-Back is designed to prevent reversal of bucket elevators and inclined conveyors due to an inner member, with wedge sists of an inner member, with wedge pockets for 6 hardened rollers, which rotates with the shaft. When the shaft attempts to reverse, the rollers wedge

against an outer cylinder. Pressure springs and plungers guarantee instant engagement of the rollers. The hold-back releases instantly when forward motion of the shaft is resumed. Manufactured by the Standard Products Division of Stephens-Adamson Mfg. Co., the hold-back mounts directly on the drive shaft and has maximum torque resistance ranges up to 350,000 inch-pounds. Bulletin 444X gives the details. Circle No. 75.

Offset Weighing Scale For Limited Clearance

Sintering Machinery Corp. has designed a new offset Transportometer weighing scale for use on new or existing belt conveyor installations where overhead clear-

ance is limited. The offset model is designed with weight integrator scale levers and suspension framework all located under the conveyor. The weight integrator, mounted in a dust-tight cabinet, can be located on either side of the conveyor.

Unlike other types of continuous weighing scales, the Transportometer contains no inherent error in its design. Weighing accuracy over its entire range is 99% percent or better, regardless of belt speed or tonnage variations. Capacities to be handled are governed only by the capacity of the conveyor belt itself. Circle No. 72 for more information.

Compressor and Dump Body For Standard Type Trucks

A new air compressor–dump body truck unit is announced jointly by Davey Compressor Co., Kent, Ohio, and the Galion Allsteel Body Co., Galion, Ohio.

The 105 cfm. compressor is of 2-stage air-cooled design and is driven directly from the truck engine by a Davey Heavy-Duty Power Take-off. The compressor unit occupies less than one-fourth of the truck body space.

The dump body itself is the latest Galion high tensile steel type. It has box type side braces, full size compressor protector, fabricated steel hardware, and extra heavy rear corners. Raising and lowering action is handled by a Model 700 Galion Allsteel Hoist with patented fulcrumatic action.

Both compressor and body are suitable for mounting on a wide range of standard motor trucks. Circle No. 67 for further details.

Passenger Car Smoothness With Torque Converter

Equipped with the Fuller Converter Drive, locomotives, front end loaders, hoists, etc. are now operating with the smoothness and ease of the modern passenger car. Designed for use with engines developing from 180- to 225-pound feet of torque in the 2,000-2,200 rpm range or higher, the torque converter coupling delivers up to 2.1:1 torque multiplication with automatic adjustment to 1:1 coupling operation as torque demand drops.

Wherever starting and stopping are frequent, wherever heavy load pickups overwork engines, gears, drive lines, axles, and operators, the Fuller Torque Converter Couplings are finding their most successful application. Circle No. 64.

Front End Loader For High Truck Beds or Bins

High truck beds or storage bins can be filled quickly by Le Roi Transo TLF-150 front end loader. Plenty of room remains between the loader and the truck, yet falling material is filling the truck in the

center. The 1½-yard bucket can be raised to full dumping height of 10 feet (lip of dumped bucket to the ground). The powerful engine, torque converter, and clutch-type reversing transmission allow smooth reversing which is 95 percent faster. For further information on this fast operating loader, circle No. 70.

New Line of Open-Top Tractor-Drawn Scrapers

The new scrapers are designed to fit any tractor-scraper job and are available in four sizes ranging in capacity from 10.5 to 28.5 cubic yards. These Carryall Scrapers are manufactured by LeTourneau-Westinghouse Company of Peoria, Illinois.

Elimination of overhead cables facilitates shovel or conveyor loading. The scrapers are operated by a double drum power control unit, whose two cables

work through swinging sheaves which are self-aligning and are mounted on the front of the scraper yoke.

Other features of these rubber-tired scrapers include positive ejection of material, heavy duty roller bearings, replaceable side runners, and heat-treated cable sheaves for correct wire rope support. Additional information on the open-top line will be sent if you circle No. 80.

SEPARATOR HAS WIDE MATERIAL RANGE: The range of materials handled by the SWECO Separator is the broadest of any screen yet developed. It will handle wet or dry, fine or coarse, heavy or light material and has broadened the field of application for screening in the ore dressing field. The 1954 SWECO Separator Catalog features a unique four-color cut-away drawing of this revolutionary vibrating screen device. Circle No. 1.

ALL ABOUT FLEXIBLE COUPLINGS: The Lovejoy Flexible Coupling Co. has issued for the first time a 20-page flexible coupling catalog. It has tables, drawings, illustrations, and complete descriptions. This catalog is a must for your file. Circle No. 2.

RADIOACTIVITY EQUIPMENT: A complete line of basic radioactive instrumentation equipment for the laboratory or field is described in Nucleonic Company of America's catalog No. 53-1. This 12-page catalog gives very detailed information about scalers, counters, detectors, and rate meter instruments. If you want to know more about radioactivity equipment, circle No. 3.

TWO-POSITION BUCKET: An improved standard bucket for the Caterpillar HT4 Shovel has been developed by Caterpillar Tractor Co. The two-position bucket will provide greater flexibility because of an adjustable pitch and a deeper bowl. This will make the unit ideal for either excavating or stockpile applications. For further information, circle No. 4.

GUIDE TO SELECTING WIRE ROPE is the title of Bergen Wire Rope Co.'s booklet telling how to obtain longer and more economical service from your wire ropes. The secret lies, according to the booklet, in correctly specifying the various details of wire rope construction according to its service requirements. It will help you write such specifications quickly and accurately. Circle No. 5 for your copy.

FILTER HAS RADICAL DESIGN: A radically designed dewatering filter, known as the Hardinge Tray Belt Filter, has been announced by the Hardinge Co., Inc. Bulletin No. AH-450 gives complete operating details as well as a discussion of the applications and operational advantages of the new filter over conventional types. The filter will have a number of applications for continuous liquid-solids separation in the mining field. Circle No. 6

HARD-TO-SOLVE WEAR PROBLEMS: Amsco's 48-page catalog has a technical section with charts and photographs which will help you select the correct hardfacing rod for those unusual or hard-to-solve wear problems. The complete line of hardfacing and build-up rods and electrodes is fully described in the catalog, as well as the metallurgical and physical properties for the four automatic and fifteen manual rods and electrodes. Circle No. 7 for your copy of American Manganese Steel Division's hardfacing alloys catalog.

VERSATILE SHOVELOADER: Baker-Lull's Model 20 Shoveloader has a 12-cubic-foot bucket and will lift 1,500 pounds of bulk material to a height of 7 feet. It has a 90-inch turning radius for close inside and outside work, and is particularly suitable for working from boxcars, bins, and stockpiles. Form No. AD-60 gives descriptions and specifications. Circle No. 8.

DOWN-HILL TRUCK SPEED CONTROLLED: A braking device which provides positive control over the down-hill speed of heavy-duty, off-highway trucks without wear on the conventional friction brakes is now available from the Allison Division of General Motors Corp. The Torqmatic Brake allows trucks to move down-hill under greater control and at higher speeds, thus making more trips per shift. Circle No. 9 for details.

LIGHTWEIGHT AIR-LEG DRILLS: Two, one-man air-leg drills have been added to the Gardner-Denver line. Model FL48 carries a 2½-inch bore drill, and weighs only 79 pounds with a 4-foot feed leg. Model FL58 carries a 2⅝-inch bore drill, and weighs only 87 pounds with a 4-foot feed leg. Either model is available with a detachable feed leg extension which provides extra length when needed. For further information on these two models, circle No. 10.

TROUBLE-FREE SUMP PUMPS: The Johnston Pump Company's Unit-Line Sump Pump is a pre-engineered packaged line from which a pump can be selected for existing conditions or for new construction. Bulletin 1029 gives construction details, head and capacity tables, dimensions, and other data. Circle No. 13.

RAYON CONVEYOR BELTS: Conveyor belts made of rayon weigh less than conventional cotton duck belts and are equally as strong. They are now being marketed by United States Rubber Co. Rayon has proved to be more resistant to ripping or tearing than duck plies and is used in both the lengthwise and crosswise directions of the belt. Circle No. 14.

"GYROTOR" AIR CLASSIFIERS: The new line of Hardinge "Gyrotor" Air Classifiers is described in Bulletin AH-449 which illustrates the operational details of the classifier. Its operational advantages over the conventional types, and flow sheets showing various applications are included. Circle No. 15.

RAILROAD CARS: Whatever kind of railroad car you're interested in, chances are you'll find it described and illustrated in this new 56-page booklet published by Gregg Company, Ltd. For more information on anything from dynamite cars to diners, circle No. 16.

DRILL STEEL EASILY ANNEALED: Alloy hollow drill steel with a wider range of hardening temperatures has been developed by the Crucible Steel Co. to meet physical specifications written by the metallurgical department of the Ingersoll-Rand Co. The new steel is more foolproof to heat treatment, is easier to forge, and requires only a simple annealing procedure for good machineability. A proper degree of hardness is easily attained. Circle No. 17.

MOISTURE TEST IN 2 MINUTES: The Olivo Moisture Meter is an accurate, precise, portable instrument for measuring the surface moisture in powdered, granulated, or fibrous materials. Available through Heyl & Patterson, it is simple and easy to operate. The surface moisture-content can be determined in less than two minutes. Using other laboratory methods, the same moisture tests would take as long as four hours. Circle No. 48.

MORE EFFICIENT SCREEN SERVICE: Hendrick Manufacturing Co. has developed two new types of heavy-duty Wedge-Slot Screens for more efficient drainage, wet screening and heavy media recovery operations. Circle No. 34 for complete data on these screens.

TWO NEW LIMAS: Type 44 is a 1-yard machine with a 20-foot boom. Equipped as a crane, it will lift 25-tons. It is available on crawler or rubber mountings. Type 803 is a 2½-yard machine with a 24-foot 6-inch boom. Equipped as a crane, it has a lifting capacity of 50 tons. The Baldwin-Lima-Hamilton Corp. will send descriptive literature upon request. Circle No. 11.

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SHAFT-MOUNTED SPEED REDUCER: The Falk Corp. has announced a speed reducer which mounts directly on the shaft to be driven and requires no floor space other than that needed for the motor and tie rod connection. Easily adapted to fit various driven shaft diameters, this drive offers comparatively high ratios of speed reduction in very limited space. Circle No. 18 for further information.

TACONITE-DUSTPROOF MOTOR: The Crocker-Wheeler Division of Elliott Co. has announced a taconite dustproof motor. It is a special modification of the CFC Sealedpower, totally enclosed, fan-cooled motor. The motor is of particular use in ore refining plants using the taconite beneficiation process where crushing, mixing, and drying operations produce an atmosphere burdened with fine magnetic dust. This dust is extremely injurious to windings, bearings, and other electric motor parts unless these parts are given special protection. For descriptive literature, circle No. 19.

IMPROVED SCREEN HEATING: The Leahy Vibrating Screen equipped with FlexElex provides for electrical heating of the screen cloth. Through improved electrical design, induction losses have been materially reduced. A substantially greater portion of the input current now is actually employed for heating the screening surface, instead of the screen frame. The Deister Concentrator Co. will furnish more information on their heated vibrating screen if you circle No. 20.

PORTABLE INDUCTION TYPE REEL: Minerals Engineering Co., through its Radiation Counter Division, has announced a portable induction-type reel to be used with Esterline Angus or other type recorders in probing ore holes. The new instrument is extremely accurate and so sensitive that formation stratography can be detected in the absence of any significant mineralization. Circle No. 21.

ONE-MAN PUSH-BUTTON JUMBO: The JSP Mobiljumbo, made by the Gardner-Denver Co., enables the operator to drill out a complete round in a face as wide as 25 feet and as high at 14 feet, without leaving his seat. The fingertip hydraulic controls are grouped in front of him on a panel. With the self-propelled Mobiljumbo, one miner can do the work of a large drilling crew. You will want to know more about this labor- and time-saving jumbo, so circle No. 43 right now.

RADIOACTIVE LIQUID FILTER: The portable Nuclear Liquid Filter made by the Atomic Energy Waste Disposal Service, differs in several ways from the usual laboratory-type demineralizers. Features which are important for the decontaminating of radioactive liquid material include the filter material in cartridge form, and a built-in shielding and effluent hold-up tank. The filter also has an indicator section to show whether the effluent is basic or acidic. Circle No. 22.

MINE LOCOMOTIVE CATALOG: Locomotives of all sizes for underground and open-pit mines are illustrated and described in the Westinghouse Mine Locomotive catalog. If you want up-to-date information on trolley or Diesel locomotives, you'll want this catalog. Circle No. 23.

FEEDER FOR DIFFICULT MATERIAL: The Com-Bin Feeder, made by Pulva Corp., was designed to make the feeding of damp, oily, difficult-to-feed materials a continuous operation. It is also used for dry solids having strong tendencies to bridge and arch. The Pulva catalog describes and illustrates the Com-Bin feeders and the Pulva-Sizers. Circle No. 24.

PUSHER PLATE FOR PAYLOADER: A wide pusher plate of heavy rolled steel for the Model HM 4-wheel-drive "Payloader" tractor-shovel has been announced by the Frank G. Hough Co. The plate is designed for rear-mounting so the machine can push stalled trucks and other equipment, and spot railroad cars. The pusher plate also has a retractable towing link to enable the "Payloader" to tow, haul, or skid loads. Circle No. 25.

FLAT TRANSMISSION BELT FACTS: A fully illustrated bulletin featuring flat transmission belts and their applications has been released by Quaker Rubber Corp. The bulletin describes the company's complete line of flat transmission belts by listing recommended uses, specifications, construction data, sizes, and lengths. Circle No. 26.

DIESEL STORY BOOK: The versatility of Cummins' Diesels is shown in a 14-page booklet just released. Full of pictures, the booklet illustrates Diesels at work from New York State's Thruway to California's Folsom Dam. Circle No. 27 for your copy.

HELP TO PIPE USERS: As a practical help to pipe users, Naylor Pipe Co. has issued a bulletin showing typical applications of its light-weight lockseam-spiralweld pipe and fittings. Included in Bulletin No. 507 are standard specifications on pipe from 4 to 30 inches in diameter, and data on fabricated fittings, flanges, and connections to meet all pipe line requirements. Circle No. 28.

A PERFECT HYDRATE right from the first drop is possible with the entirely new type of hydrator developed by Kennedy Van Saun Mfg. and Eng. Corp. for dolomitic or calcitic lime. The novel feature of this hydrator is the use of a method of heat exchange and control, together with the use of mass reaction. This method enables the hydrator to be started in the coldest weather. The hydrator can be stopped and restarted without damaging the material undergoing hydration. Circle No. 12 for further information on this new hydrator.

CUT DRIFT REPAIR COSTS: "Commercial" circular steel sets provide the support needed to keep your drifts open and serviceable long after timber sets fail. Costly shutdowns and delays are avoided, and production is increased. The installation of "Commercial" steel sets is simpler and easier than standing timber. For all the details on circular steel sets, circle No. 45.

TWO TYPES OF ROCK BOLTS: Colorado Fuel and Iron Corp. make the slot and wedge-type rock bolt or the expansion shell type. CF&I rock bolts offer greater safety and economy. Full information on these two types of rock bolts is now available. Circle No. 32.

DRILLER'S HANDBOOK: Don't miss out on this. A completely revised, pocket-size reference book that gives you all the facts about rock drills. It tells about lubrication, operating, maintenance, shanks and bits, compressed air lines, drilling and blasting, and lots more. Circle No. 41.

AIR AND ELECTRIC MINE HOISTS: The Joy mine hoist bulletin describes the complete line of Joy single-drum mine hoists. It includes the "Turbinair" series, the "Pistonair" series and the electric-powered models. You will want this bulletin for your files. Circle No. 40.

HEAVY-MEDIA MOBIL-MILL: For treating any ore amenable to heavy-media separation, WEMCO Mobil-Mills offer flexible design, minumum first cost, low operating costs, and are prefabricated for quick and low-cost field assembly. Bulletin M-3-M-5 tells all about the Mobil-Mill. Circle No. 38.

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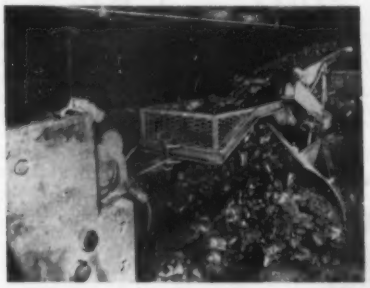
Track Cleaner Pays For Itself After Two Miles

The Canton Track Cleaner more than paid for itself in labor savings at one mine after two miles of track had been cleaned. All track cleaning previously had been done by hand.

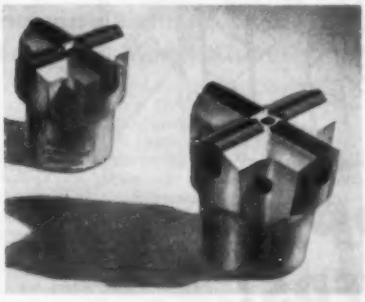
In cleaning one 8,600-foot section, 67 cars were loaded in three shifts with a three-man crew. Most of the material loaded was wet and well packed. Mine officials estimated that the job would have taken four months by hand and cost $4,200 more.



The American Mine Door Company, makers of the Canton Track Cleaner, say that savings are so substantial with the track cleaner that no mine can afford to be without one. Circle No. 74 to find out how this track cleaner can save you money.

Carbide-Tipped Rock Bits Added to Coromant Line

A full series of carbide-tipped detachable rock bits will be added to the Coromant drill steel line, according to Copco Pacific, Ltd. The bits will be available in diameters ranging from 1⅝ inches to 4 inches.



Field tests on selected Western projects are now under way to compile case history data, and to verify records of Canadian comparative tests which showed the bits to be drilling up to 300 percent more footage. This remarkable improvement was the result of a Coromant formula for the carbide insert and also a special Swedish steel used in the skirt and body of the bit. Circle No. 66 for detailed information on these bits.

New 32-Ton Trailer Dumps On The Run

The new Easton Car and Construction Company's Model TD-1832H side-dump trailer will dump while in motion. This makes it a versatile and adaptable

unit for many types of off-highway hauling jobs. It is built to work with the Caterpillar DW20 tractor and has successfully passed its first on-the-job test, hauling 32-ton earth loads on a stripping and fill operation.

The big single tires, low center of gravity, and outboard-mounted hydraulic jacks assure remarkable lateral stability, even while dumping on the run. Dumping is powered by two outboard-mounted hydraulic jacks controlled from the operator's seat. It dumps to one side only, but interchangeable mounting of the body and jacks permits the direction of dump to be reversed.

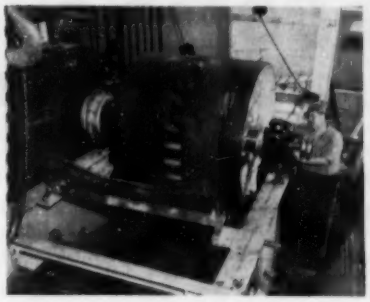
Easton's patented door mechanism operates automatically as the body is raised for dumping, or lowered. While the maximum dumping angle is 50 degrees, the door becomes flush with the floor at 20 degrees and forms a chute to discharge the load clear of the running gear. For further information on Easton's new side-dump trailer, circle No. 77.

IT'S NEW (No.) CIRCLE IT

King Size Magnetic Pulley Believed World's Largest

Stearns Magnetic, Inc., Milwaukee manufacturer of magnetic separation and power transmission equipment, has built what is believed to be the largest electromagnetic pulley in the world.

The pulley is installed in the Oak Creek Power Station operated by the Wisconsin Electric Power Company, and will magnetically remove all tramp iron from the coal used at Oak Creek to prevent damage to expensive crushers and other equipment. The unit is 60 inches in diameter with a 48-inch face.



Another unique feature of this pulley is the new method of lagging that has been developed for this type of equipment. The new lagging is a thin, tough strip of material with firmly embedded granules in it. It provides three times the traction of rubber lagging without belt wear and permits maximum use of the pulley's magnetic strength.

Notes From The Manufacturers

Harold N. Propp, former central district manager for Nordberg Manufacturing Company of Milwaukee, Wisconsin, will head the new south central district organization in St. Louis, Missouri. The office will serve crusher, screen, and process machinery customers in the south central and southwestern states.

John C. Dix of the Euclid Road Machinery Company has been appointed district manager for Euclid's operations in Georgia, Alabama, Florida and the eastern part of Tennessee. Mr. Dix will make his headquarters in Atlanta, Georgia.

Burt Powell has been appointed advertising manager of Caterpillar Tractor Company. He succeeds W. K. Cox who has recently been named manager of the sales promotion department.

G. J. COFFEY, president of the Chicago Pneumatic Tool Company of New York, and chairman of the Consolidated Pneumatic Tool Company Limited, London and Fraserburgh, recently visited in England. Here, NORMAN READMAN, managing director of Consolidated Pneumatic Tool Company, Limited receives R. B. SIMS and introduces him to Mr. Coffey. Mr. Coffey visited the company's factories at Fraserburgh and Aberdeen and branch offices on the Continent.

J. Delano Hitch, Jr., former executive vice president of the Dorr Company, Engineers, is now serving as president of the company. He succeeds *E. R. Ramsey*, who has retired after 39 years with Dorr. Mr. Ramsey will serve as vice chairman of the board and consultant.

Donald W. Hayworth has been named manager of the Edmonton Branch and western sales representative for Canadian Aero Service, Ltd., and Spartan Air Services, Ltd., of Ottawa. Mr. Hayworth will represent the two companies in connection with aerial surveys and flight operations now in progress in the Prairie Provinces and British Columbia.

Charles H. Myers has been appointed assistant to the manager of the mining department of Mine Safety Appliances Company of Pittsburgh, Pennsylvania. Mr. Myers, who has been with the company since 1939, formerly was a mining sales engineer in the Fairmont, West Virginia area. *M. E. Condit* will replace Mr. Myers in that area. He has been with the company since 1949. *W. C. Endean*, formerly with the company's International Department, will replace Mr. Condit in the Pottsville, Pennsylvania mining sales office.

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Homestake Leading Wyoming Uranium Producer; Options Little Beaver and Other Utah Claims

Homestake Mining Company was the largest producer of uranium ore in Wyoming in 1953. Homestake discovered deposits in the Carlile area by aerial-radiometric surveying in the spring of 1952. Later that year anomolies were evaluated by wagon drilling and mineable deposits containing more than 0.20 percent U_3O_8 were found in the upper part of the Lakota sandstone. About 5,500 tons of uranium ore were mined by open pitting and shipped to the Edgemont, South Dakota ore-buying depot of the United States Atomic Energy Commission. Underground exploration is now underway.

Homestake has also concluded negotiations for the purchase of all the capital stock of the Little Beaver Mining Company, Inc., a Utah corporation.

Little Beaver owns several uranium claims in the vicinity of Moab, San Juan County, Utah. Under the terms of our agreement, the capital stock of Little Beaver and certain other documents will be deposited in escrow, whereupon Homestake will make a down payment of $60,000 on the purchase price. Further payments toward the ultimate purchase price will be paid periodically out of profits as ore is produced. Drill holes prove the occurrence of ore, but actual underground access to the drilled area is necessary before its ultimate importance can be known.

In San Juan County, Utah, Homestake is also very active in the uranium exploration and mining business. The firm has recently obtained purchase options on a large block of unpatented claims at the east end of Dry Valley. The claims, in some instances, adjoin the well-known Dry Valley and Waterfall group of the Molybdenum Corporation of America.

Harvard Business Course For Colo. Mines Alumni

A fellowship designed to produce future leaders for the mineral industries with both engineering and business administration backgrounds has been established for graduates of the Colorado School of Mines who have at least two years' working experience in mineral engineering either before or after graduation.

The fellowship will provide for a two-year course leading to a master's degree in business administration at the Harvard Business School. Each fellowship carries a $1,500 per year grant-in-aid. The initial recipient will be announced in September by the Harvard Business School, and others will be announced each fall.

Financial support for the program came from 11 executives intersted in the School of Mines. William J. Coulter, of Denver, former vice president of Climax Molybdenum Company, is chairman of the group. Other members include George R. Brown, vice president of Brown and Root, Inc., Houston, Tex.; Arthur H. Bunker, president of Climax Molybdenum Co., New York; Frank Coolbaugh, general manager, Climax Molybdenum Co., Climax, Colo.; Arthur C. Damon, president of the Denver Equipment Company, Denver; Ben C. Essig, vice president, Gardner-Denver Co., Denver; Max Grimes, general manager of Morse Brothers Machinery Co., Denver; A. E. Humphreys and I. B. Humphreys of the Humphreys Foundation, Denver; Harvey Mathews, vice president, Stearns-Roger Manufacturing Co., Denver; Elmer R. Ramsey, vice chairman of the Dorr Co., Stamford, Conn.; and Max Schott, former president of Climax Molybdenum Co., New York.

Utah Copper Cuts Output 14 Percent February 15

Kennecott Copper Corporation's Utah Copper Division, the largest copper mine in the world, cut output by about 14 percent on February 15 by limiting operations to a 6-day week. A substantial reduction in the demand for copper forced curtailment, according to L. F. Pett, Utah Division general manager.

Utah's mine, mills, and refinery have been operating seven days a week, and employees have been working 48 hours a week. Under the new schedule, operations will be closed Sundays and employees will work 40 hours a week.

The cut in mine tonnage at Utah Copper Division represents about a 14 percent reduction in output. Production had been about 580,000 tons of ore per week, and under the new schedule 498,000 tons will be mined and milled weekly.

Utah Copper Division employs approximately 5,600 workers, and the curtailment will not cause any employee layoffs.

Kennecott also curtailed production at its Ray, Arizona mine; Ruth, Nevada mine; and Santa Rita, New Mexico mine on February 1st.

Chemico To Operate Calera Cobalt Plant By Contract

The Howe Sound Company has entered into a contract in behalf of its subsidiary, Calera Mining Company, with the Chemical Construction Corporation for the latter to manage and operate Calera's cobalt refinery at Garfield, Utah.

Chemico, a subsidiary of American Cyanamid Company, designed and built the refinery and is the licensor of the refining process. Under the contract which became effective 15 February, 1954 for a two-year period, Calera will furnish cobalt-copper concentrates from its Blackbird mine in Idaho. Chemico will operate the plant and be paid a fixed toll per pound of cobalt alloy or other marketable cobalt products produced.

Uranium Leases Permitted On Withdrawn Mining Land

The United States Atomic Energy Commission has issued a regulation providing for issuance of uranium mining

Climax Moly Largest Underground Mine in U. S.

The Climax Molybdenum Company's mine, pictured above, is now the largest underground mine in the United States. It is now producing 27,000 tons of block-caved ore per day. The portal of the main operating Phillipsen Tunnel is at the extreme left of the picture. Several ore trains are shown on the way to the crushing plant, lower right. Nos. 1 and 2 mills are at the extreme lower right corner. The end of the 4,000-foot-long conveyor belt from the Storke Level can be seen just above the water tower at the lower right corner. The new Nos. 3 and 4 mills are just to the right of the pictured area. The large caved area in the center of the picture shows how the entire side of Bartlett Mountain has been undercut and the ore withdrawn from below to form the huge mined-out crater. In the last year more than 3,000,000 tons of ore have been mined from the new Storke Level 300 feet below the Phillipsen. In 1953 Climax produced 37,306,341 pounds of molybdenum equivalent to two-thirds of the molybdenum produced in the Free World. Anticipated production in 1954 under the expanded mining program is 42,500,000 pounds.

leases on certain public lands affected by the Mineral Leasing Act of 1920, particularly public lands covered by oil and gas leases.

The regulation, Domestic Uranium Program Circular No. 7, is designed to encourage private companies and individuals to develop and produce uranium-bearing ores from public lands embraced within an offer, permit, application, or lease under the Mineral Leasing Act of 1920, or from lands which are known to be valuable for minerals leasable under that Act. Such lands are not open to mineral entry under the mining laws.

A large number of oil and gas leases have been issued on the Colorado Plateau, the center of domestic uranium production, and in other areas of the western United States where prospecting for uranium is active.

About two years ago it was discovered that many properties had been staked for uranium on areas already covered by oil and gas leases. Public Law 250, 83rd Congress, signed by the President on August 12, 1953, provided for the creation of valid mining claims on areas so staked between July 31, 1939 and January 1, 1953. Such staking subsequent to January 1 creates no rights, however.

Domestic Uranium Program Circular No. 7 will make lands, closed to entry under the mining laws, available for uranium mining purposes under Commission leases.

Under the new regulation the lands for which a lease is sought will consist of one or more tracts, not to exceed 1500 feet in length by 600 feet in width each. A person seeking a lease must record a "Notice of Lease Application" for each tract in the office of the County Recorder of the county in which the tract is situated within 30 days after he has identified, marked and posted the land. Within the next 60 days he must file a lease application, on a prescribed form, with the Grand Junction Operations Office of the Commission, P.O. Box 270, Grand Junction, Colo.

Shattuck Denn Now Mining Uranium Ore in Colorado

The Shattuck Denn Mining Company has made its first shipment of uranium-vanadium ore from its United States Atomic Energy Commission lease on Club Mesa four miles west of Uravan, Colorado, according to Tom Newell, vice president and superintendent. Ore shipments followed contract completion of shaft sinking to a depth of 500 feet by Minerals Engineering Company to reach the ore-bearing horizon discovered by surface diamond drilling by the AEC. After completion of shaft sinking, level development was started and six feet of ore was soon developed. Shattuck Denn has its own camp and headquarters for the uranium division near Uravan.

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used to destruction - no resharpening

Liddicoat is the detachable bit that is "used to destruction" and then discarded. The strong connection . . . no threads . . . provides longer steel life and makes the changing of bits quick and easy. No delays, no resharpening, no extra costs.

1 1/4"

1 3/8"

1 5/16"

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The type 1-L Liddicoat is successfully used with either 7/8" quarter octagon or 7/8" hexagon drill rods. Made in sizes from 1 1/4" to 1 7/8", LIDDICOAT provides a wide range of application. The three most popular sizes used in drilling for the setting of rock bolts are: 1 3/8", 1 5/16" and 1 1/4" . . . made in either center or side hole. The type 1-L bit is designed with the fast two-stage cutting and V-shaped pilot for rapid collaring of holes. Low first cost — low cost per foot of drilling.

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Where a Tungsten carbide bit is indicated the TEE CEE is designed for on-the-job interchange with the famed LIDDICOAT bit that is "used to destruction." TEE CEE and "used to destruction" bits both fit the same drill steel. For full details, call on us or write.

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COLORADO

The *Idarado Mining Company* has installed a new vibrating grizzly feeder ahead of the 18- by 36-inch jaw crusher at its underground primary crushing plant in its *Idarado* mine, Ouray County, Colorado. Idarado has been doing all primary crushing underground since March 1949. Underground crushing insures maximum loads in ore cars, permits mixing of ore from various stopes on the several veins, and was cheaper to install than a comparable (200-ton-per hour) sized surface crushing plant. John S. Wise is general manager.

Ute Uranium Company has signed a contract with Johnson and Louvan contractors in Naturita, Colorado, for 7,500 feet of core drilling on *Ute* property in the Bishop Canyon area of southwest Colorado. F. W. Ferguson of Cripple Creek is president of the firm.

The *Worcester Mines Company* has shipped its first lot of ore from its U. S. Atomic Energy Commission lease to the *Vanadium Corporation of America* processing plant at Naturita, Colorado. Worcester Mines is operating on the Dolores Rim northwest of Uravan, Colorado. The ore body was discovered by surface diamond drilling by the AEC and subsequently leased to Worcester Mines, who sank a 290-foot vertical shaft. Ore developed to date is reported to be thin but of good grade.

The *J. R. Simplot Company* is shipping 400 to 600 tons of uranium ore per month to the *Vanadium Corporation of America's* processing plant at Naturita, Colorado. Simplot is mining the ore at its *Bull Canyon Mines* where it recently completed a long inclined shaft to reach ore bodies discovered by diamond and Porta-Drilling. Simultaneously, Simplot is carrying on an aggressive exploration drilling program on adjoining claims. Lewis P. Gaggini is superintendent of Simplot's uranium activities.

SMOOTHS WINTER OUT OF HAUL ROADS AT ⅓ THE COST OF LARGE GRADERS

Mine haul roads take a real beating from winter's ravages. Frost boils, ruts, excessive breakup — all need urgent attention before roads can efficiently handle spring's increasing traffic.

The Allis-Chalmers Model D Motor Grader is tailor-made for mine road maintenance . . . yet with all its capacity to do outstanding work on large or small jobs, this versatile machine costs only one third as much as a large grader.

With a powerful 50 brake hp. engine, backed by sure-footed tandem drive, the Model D with ROLL-AWAY* moldboard blades faster, smoother and easier — on grading and leveling, ditching and sloping, and other maintenance jobs. Its compact design allows it to keep working when trucks pass . . . no need to pull off the road. In addition, power circle turn and leaning front wheels are available as optional equipment.

For handling a variety of year-round jobs, the Model D has easily mounted attachments — hydraulic rear-end loader, scarifier, snowplow and windrow eliminator.

The full story and a demonstration of the versatile Model D awaits you at your Allis-Chalmers dealer. See him soon.

Weight — 8,800 lb. (bare)
Brake hp. — 50
Speeds — four forward to 25.6 mph.
reverse to 3.3 mph.

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"Commercial" Steel Sets KEEP THE ORE MOVING-

Block-caving method of ore mining is more profitable when "Commercial" circular steel sets are installed in mine drifts because more continuous and more uniform draw of ore reduces mining costs. Circular steel sets provide support needed to keep the drifts open and serviceable long after timber sets would fail even in heavy ground.

The installation of "Commercial" steel sets is simpler and easier than standing timber; normal maintenance cost is less because minor repairs are reduced to a minimum. Costly shutdowns and delays are avoided; in fact, the entire operation is speeded up.

"Commercial" was first to produce circular steel sets. An established product for years again has found acceptance in another more recent application which has helped to reduce the hazards in block-caving mining.

Pounds of "Commercial" circular sets will increase the ore draw in tons.

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ROCKY MOUNTAIN

UTAH

Cal Uranium Company's work on the sinking of the San Juan vertical shaft in the Big Indian Valley area, Utah is proceeding satisfactorily. The shaft is down 230 feet below the collar and will bottom at 280. The ore body is expected to be cut at the 260 level. Mining will begin as soon as the shaft, skip pocket, and haulage level station have been completed.

Western Mining and Development Company has announced discovery of uranium on its property in the Lisbon Valley of San Juan County, Utah approximately seven miles southeast of the famous *Utex* mine. Ten diamond drill holes have indicated that the ore body is 8 to 10 feet thick. The property is a school section tract of 640 acres leased from the state of Utah.

The *Vanadium Corporation of America* has started sinking of an 80° incline winze below its 750-foot ore-bottom level of its Freedom Mine at Marysville, Utah. The VCA has developed a series of nearly-parallel veins containing important pitchblende reserves from its main vertical shaft. A 2,000-foot-long cross-cut haulage level at the 750-foot point speeds simultaneous mining on the separate veins.

The *Uranium Corporation* is conducting intensive exploratory drilling on its 12 claims located between Charles Steen's *Mi Vida* mine and T. C. Hudson's *La Sal* uranium strike about 35 miles northeast of Monticello, Utah. Dr. Paul T. Walton, Salt Lake City geologist, is supervising the 12,000 feet of drilling. In exchange for 50 percent working interest in the claims, Dr. Walton will spend a minimum of $50,000 in exploration. Reede W. Brinton is president of the firm.

Six Kellogg mining companies, *Signal, Silver Bowl, Nancy Lee, Caledonia Silver-Lead, Coeur d'Alene Silver Giant,* and *New Era Mines,* have joined in exploration and development of the *Hot Rock* and *Radon* groups of claims in the Big Indian uranium mining district of San Juan county, Utah.

Naildriver Mining Company, an affiliate of *United Park Mines Company,* has found mineralization during exploration in the Park City, Utah district. The firm is exploring at depth off the Star of Utah tunnel for extension of the old silver-lead-zinc Naildriver ore body.

More than $2,000,000 worth of ore has been produced since August 1, 1950 in the Temple Mountain mining district of Emery County, according to a report issued by the *Consolidated Uranium Mines, Inc.* E. G. Frawley, president of Consolidated, said in his report that 79,885.96 dry tons of uranium-vanadium ore had come from the company's properties, mostly from Temple Mountain. Several new units are being prepared for production at Temple Mountain with 10 units now operating. The company is also increasing production at its *Muddy River* property, 30 miles southwest of Temple Mountain.

GSA, duPont Begin Studies For New Titanium Plant

Plans to begin design and engineering studies of a proposed titanium plant in Tennessee have been started by the General Services Administration and E. I. duPont de Nemours and Company, Inc.

Although no definite agreement to build the plant has been drawn up, data is being gathered for the project which would produce between 7,000 and 8,000 tons of titanium annually.

DuPont will spend a maximum of $600,000 of its own funds in engineering studies. The plant, if built, will cost the government more than $30,000,000. Preliminary plans call for erection on a site adjoining the TVA steam power plant between Waverly and Camden.

The duPont contract is only one of several GSA has contracted for titanium production. The agency also has an agreement with the Titanium Metals Corporation of America to produce 18,000 tons over a five-year period, and with Cramet, Inc. to produce 6,000 tons annually. A previous contract with duPont calls for production of 13,500 tons over a five-year period. A government-owned pilot plant at Boulder City, Nevada is now producing 20 tons monthly.

United States Senator George W. Malone has been studying the titanium situation in his subcommittee on domestic ores which reopened hearings February 1. Senator Malone, who said he had been advised by the GSA of plans to increase output, has been pressing for expanding titanium production as a means of maintaining American air superiority.

Davis Mining Builds Wisconsin Zinc Mill

Construction of a jig and flotation mill has been started by Davis Mining Enterprises on the Arthur lease near Linden, Wisconsin. The project is financed in part by a $220,000 loan from the Reconstruction Finance Corporation to fulfill a DMPA floor contract granted April 2, 1952, for the production of 6,000 tons of 60 percent zinc concentrate to be based on 15.50 cents market price for slab zinc.

Under lease to Davis Mining Enterprises (formed by Vernon C. Davis) are about 500 acres of mineral rights, held in seven leases, all within two miles of Linden. 300,000 tons of measured ore in the seven leases average five percent zinc as sphalerite with minor amounts of galena.

Initial ore will be mined from a double pitch ore body on the Arthur and Kickapoo leases which was last worked in 1917, though mining operations were conducted as late as 1932 on an extension of the same ore body two miles to the northeast, known as the North Rule mine. The ore body will be dewatered through an old shaft, and a 260-foot adit at a minus 12 percent grade will be driven into the south pitch. Mining will be by room and pillar, drilling with jackleg, and ore will be loaded mechanically into Diesel trucks for haulage to the surface.

Mill construction is under way on a 12 percent slope some 300 feet distant from the mouth of the incline. An initial mine production of 240 tons per day is planned. Primary crushing will be by jaw crusher and secondary crushing by gyratory crusher to produce minus-½-inch jig feed. Ore will be concentrated in the jig mill at a ratio to produce 140 tons of ball mill feed. Fines from all three dewatering classifiers in the jig section will be sent to a thickener which will return them to the flotation circuit. Four flotation cells will comprise the lead circuit, and the concentrate produced therefrom will be cleaned on a table. Eight cells will be used to concentrate zinc sulfide—six cells for roughing, one for cleaning, and one for recleaning. W. B. MacPhee will be in charge of milling operations.

Zinc concentrate from the mill will be trucked four miles to Edmund, Wisconsin, and shipped via rail to the Matthiessen & Hegeler smelter at LaSalle, Illinois.

Athletic Mining & Smelting Company of Fort Smith, Arkansas has closed its zinc smelter because of the drop in the price of slab zinc over the last 19 months from 19½ cents to 9½ cents while labor and material costs had increased. The firm had been producing 1,500 to 2,000 tons of slab zinc a month. About 210 employees have been laid off.

The *Providence Mining Company* of St. Joseph, Missouri is renewing activity at the *Providence Hill* iron mines five miles south of Mansfield, Missouri. A $52,000 washing plant is being erected on a 20-acre tract in the area. The *Rogers Iron Works Company* of Joplin is doing the construction work. Production is expected to be about 100 tons a day when mining gets under way at the open-pit operations.

Bethlehem Steel Company and the General Services Administration are negotiating for the construction of a semi-commercial nickel plant at Bethlehem, Pennsylvania. Bethlehem has been working on a chemical process in a small pilot plant for some time, and this process is reported to be effective in separating aluminum, chrome and iron in the ore processed at the plant. The new plant would be capable of handling about 150 tons of iron ore a day, according to present proposals.

Warren Foundry and Pipe Corporation is reportedly planning to resume production at its *Beach Glen* mine in New Jersey, and is also stripping an area near Hibernia preparatory to mining magnetite iron ore there by open-pit methods.

American Zinc, Lead & Smelting Company reportedly plans to close its Hillsboro, Illinois metal plant and its *Grasselli* mine at New Market, Tennessee early this month. The Hillsboro plant produces at a rate of 650 tons of slab zinc a month, while the Grasselli mine turns out 1,000 tons of 60 percent zinc concentrates a month. Low metal prices are cited as the reason for the closures.

After several weeks of intensive preparation and renovation of the plant and washer, production was resumed at *International Minerals & Chemical Corporation's Achan* mine at Bartow, Florida. A recent fire caused $25,000 to $30,000 worth of damage to the Super Scooper,

Bethlehem Enlarges Maryland Port Facilities

The recent 1,000-foot extension of its ore dock basin to 2,200 feet is enabling the Bethlehem Steel Company plant at Sparrows Point, Maryland, to unload with greater facility the approximately 7,000,000 tons of iron ore it normally receives annually. It is now possible to unload three large ocean-going vessels simultaneously—as shown in the photograph above—while a fourth vessel (extreme right) prepares to leave after having discharged its cargo. These vessels are, right to left: Ore Navigation Corporation's *Bethore*, 550 feet long, and *Feltore*, 560 feet, both 25,000 deadweight tons, carrying Bethlehem's El Pao ore from Venezuela and Tofo ore from Chile, respectively; the *Katinga*, a 418-foot Liberty on charter, of 10,900 deadweight tons, and the *Sandwich*, a 261-foot chartered vessel of 5,000 deadweight tons, the latter two carrying purchased ore. The extension project required dredging to a 40-foot depth, mean low water, and removal of 1,350,000 cubic yards of material. Additional facilities installed were a 15-ton ore unloader and a 20-ton combination ore unloader and bridge. This extra equipment affords a greater unloading capacity of 2,880 tons per hour.

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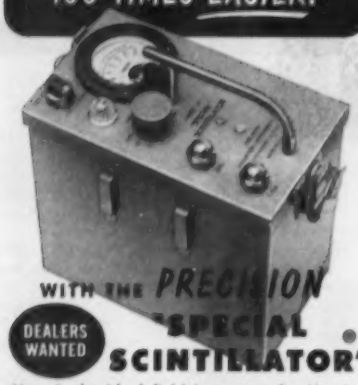

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General Services Administration Purchases of Strategic Minerals Through December 31, 1953

Mineral	*Authorized*	*Date*	*Quantity*	*Purchased To End 195?*
Tungsten	3,000,000	May 11, 1951	Short ton units	599,893
Manganese				
Butte and Phillipsburg, Montana	6,000,000	July 21, 1951	Long ton units	428,809
Deming, New Mexico	6,000,000	July 21, 1951	Long ton units	789,618
Wenden, Arizona	6,000,000	July 3, 1952	Long ton units	2,089,283
Car Load Program	19,000,000	July 9, 1952	Long ton units	557,252
Chrome				
Grants Pass, Oregon	200,000	August 28, 1951	Long tons	46,640
Beryl				
Franklin, New Hampshire; Custer, South Dakota; Spruce Pine, North Carolina	1,500	October 11, 1952	Short tons	145
Columbium-tantalum				
United States and abroad	15,000,000	October 30, 1952	Pounds	3,485,507

reported to be the world's biggest dragline. However, no delay is expected in putting the huge machine into operation.

A new record high of 111,600,445 net tons of steel was produced in the United States in 1953, according to the American Iron and Steel Institute. This was 18,432,406 tons greater than in 1952, and 6,400,000 tons higher than the previous record set in 1951.

A recent publication of the United States Geological Survey is entitled "Prospecting for Uranium with Car-Mounted Equipment," by J. M. Nelson. The USGS has used the method since 1945. Its prime advantage is the rapidity of the scanning process, 100 to 200 miles per day, which permits exploration of large areas in a short time. The bulletin is number 988-I, and is available from the Superintendent of Documents at 15 cents.

Wider adaptation of the Humphreys spiral concentrator is prevalent in the Spruce Pine mica district of North Caroline. It has helped to recover up to 75 percent of the fine mica formerly lost in reclaiming this product. Based on what has been accomplished in the last two years, it appears that the spiral will be operating in all dry-ground mica plants in the district by the end of 1954. Another advance method is in operation on fine mica obtained as a byproduct in the recovery of feldspar from alaskite. Part of the mica recovered by this process is in very small particles consisting of the same type of "book" formations in which large sheet mica occurs. To break up these minute books, the Majac machine is used. Adaptation of this has meant recovery of many tons monthly of fine mica that has long been wasted, according to experts in the area.

IRON RANGES

Skubic Bros. has taken over the operation of the *Ernie* mine, located just north of Virginia, Minnesota, on lease from the *Haley-Young Company.* Haley-Young opened up the Ernie during the 1953 season. Ore from the mine will be shipped to Skubic Brothers' concentrator located at Eveleth for beneficiation and reshipment to the ore docks.

A heavy construction schedule is being maintained by *Pickands Mather & Co.* this winter with three plants under construction. An addition is being made to the West Hill plant, involving a 160-long-ton-per-hour cyclone installation; a complete new plant is being installed at the *Tioga* property, including crushing, screening, washing, HMS, and cyclone; and a plant involving the same processes is being installed at the *Mahnomen* property on the Cuyuna Range by Pickands Mather.

Oliver Iron Mining Division of the *United States Steel Corporation* expects to complete a new crushing, screening, and washing plant at the *Plummer* mine by July 1954.

M. A. Hanna Company has a jig and HMS installation under construction at the Carlz mine, where a washing, screening, and crushing plant were placed in operation last season. At the *Morton*, Hanna is installing a new skip hoist, and a washing, screening, and crushing plant.

Cleveland-Cliffs Iron Company has only one plant under construction this winter on the Mesabi Range. It involves a second heavy media unit at the *Canisteo* mine. In Michigan, however, Cleveland-Cliffs has two plants under way. The Humboldt flotation plant is expected to be in operation early this month. The Republic plant, which is similar but somewhat larger than the Humboldt installation, will not be ready until 1955.

During the winter season, *Republic Steel Corporation* is stripping overburden from the *Susquehanna* and the *Stevenson* iron ore properties at Hibbing, Minnesota. In Michigan, the firm is stockpiling iron ore at the *Penokee* mine at Ironwood, and at the *Tobin* mine at Crystal Falls.

The *Mahoning* open-pit mine at Hibbing, Minnesota held its place in 1953 as the largest shipper of the *Pickands Mather & Co.* mines, having shipped 3,279,428 tons in 1953. The *Embarrass* mine at Biwabik remained in second place with 1,366,757 gross tons, and the Danube was third with 796,462 gross tons.

W. S. Moore Company is installing a jig plant at its Virginia concentrator near Virginia, Minnesota. This is a supplement to the present washing and heavy media installation.

Rhude and Fryberger are installing a washing plant at the *Boeing* mine to supplement the crushing and screening plant that was built last year.

The keel plate for the longest and widest ore carrier on the Great Lakes has been laid at Lorain, Ohio. *American Shipbuilding Company* is constructing the carrier for the *National Steel Corporation. M. A. Hanna Company* will operate the vessel. The carrier will be 710 feet long with a beam of 75 feet. She is expected to make her first trip in 1955. Because of the extreme length, the ship will not be launched in traditional fashion but will be floated in the drydock in which it is being constructed.

Standard Tungsten Opening New Mexico and Arizona Mines and Revamping Pomerene Mill

The Standard Tungsten Corporation of New York, New York, is developing several tungsten properties for future production in Cochise County, Arizona, and Hidalgo County, New Mexico. Among them are the Tungsten King, purchased from S. C. Kramer; the Kries, leased from John F. Kries of Warren; the Silver Hill, leased from E. F. Epley; and the Granite Peak in New Mexico.

At the Tungsten King, a DMEA loan is being applied to exploration work on the south end of the ore body. This loan calls for the sinking of a 100-foot shaft and for about 100 feet of drifting. The operators expect to employ five men and to produce about 30 tons of ore per day after the mill is completed. At the Kries mine, 17 miles north of Tombstone in the foothills of the Dragoon Mountains, work is to start shortly on an adit to be driven into the hillside. Three men will be employed. Development work at the Silver Hill, about one-half mile north of Paradise, has been designed to block out ore for future production. One raise has been completed and a second is underway. Operators plan to start mining ore for trucking to the mill within the month. Production at the rate of 15 tons per day, with three men employed, is expected. Another 15 tons per day is to be trucked to the mill from the Granite Peak mine in New Mexico.

Extensive improvements and additions also are being made to the Pomerene tungsten mill, located on the San Pedro River about ¾-mile west of Pomerene, Arizona, which was purchased last fall from the Kramer Mining and Milling Company. The mill will have a maximum capacity of 150 tons per day and is scheduled for completion about April 1. Milling equipment will consist of a Denver 150-ton jig, a clean-up jig, four Wilfley tables, three Denver flotation cells, a 4-compartment hydraulic classified, jaw crusher, rolls, ball mill and a 1,000-ton ore bin. The operators expect to obtain a plus 60 percent concentrate with better than an 80 percent recovery.

Dr. S. C. Hu is president and chief engineer of Standard Tungsten. Henry G. Grunstedt of Tucson, is engineer in charge of Standard's general development program in the area; James Baize of Benson is in charge of mill construction; Othel Conger of Pomerene, and Ralph Pursley of McNeal are supervising mine operations.

USV Completes 1,500-Foot Raise At Pine Creek Mine

The United States Vanadium Company has completed a twin raise 1,500 feet high at its Pine Creek tungsten mine northwest of Bishop, California. The raise was started in November 1950 from the company's main (zero level) workings and holed through to the A Level Thursday January 14, 1954.

Two separate raises 30 feet apart were driven simultaneously and interconnected by a small drift every 30 feet. The main raise is 8 by 15 feet in rock section and is timbered with square sets to form two 6- by 6-foot compartments. The second raise is an 8- by 8-foot untimbered ore pass. In driving the raise, 45 tons of dynamite and 397,400 board feet of timber were used. Completion of the raise will permit the company to resume production of ore from the mine's upper levels and to transfer it through the raise to the zero level for tramming to the head of the aerial tramway which connects with the 1,000-ton flotation mill.

United States Vanadium crews under the supervision of H. L. McKinley, general manager; A. C. Sada, general superintendent; T. W. Holmes, mine superintendent; and T. R. Latham, mine foreman completed the raise.

Kennecott Work Week Cut By Drop in Copper Demand

Employees at the Arizona, Nevada, and New Mexico divisions of the Kennecott Copper Corporation were placed on a 40-hour work week beginning February 1. Curtailment of the former 6-day week was due to a substantial reduction in the demand for copper, according to managers of the three divisions.

The cut in tonnage will amount to 20,000 tons per week at the Nevada Mines Division and 15,000 tons at the Ray Mines Division in Arizona. Figures for the New Mexico Chino Mines were not available, but it is understood that the reduction there will bring monthly production down to 550,000 tons. Company statements from all three mines said that the new plan would not involve any lay-offs.

Production at the Chino Mines had previously been on a 24-hour, seven-days-a-week basis, while the Nevada and Arizona mines had been operating on a six-day week.

Standard Sulphur Opens Mine at Rosenberg, Texas

Production started last fall at the Damon Mound, 20 miles south of Rosenberg, Texas where Standard Sulphur Company hopes to establish itself as a major sulphur producer.

The firm was founded by Gilbert Ebarb, now president and director, who believed that recovery of sulphur from the mound could be done commercially if the plant were located on the deposit thereby eliminating the need for long water lines from the plant to the sulphur wells. The company acquired a leasehold on 800 acres at Damon Mound and early in November, 1953 the No. 1 well began producing about 250 long tons daily running between 99.92 and 99.97 percent sulphur. Output has been increased to 350 long tons per day by completion of Damon Nos. 2 and 3 wells.

When a particular area has been exhausted the plant can be moved to the next area that has been prepared for production. However, in the immediate area of the plant's present location, approximately one-half million tons of recover-

California Chrome Mine Is Second Largest in U. S.

The Castro Chrome Associates mine near San Luis Obispo, California is now producing 100 tons of chrome ore per day. Production from this mine, which is the largest chrome producer in California and the second largest in the United States, is an important addition to the government's stockpile of this critical metal. The ore which occurs in altered basic igneous rocks, is mined largely by open-pit methods with some underground mining being done through a 15 percent inclined adit. Ore bodies consist of horizontal lying pods, or lenses, which vary in size from a few thousand tons of ore to 22,000 tons. The ore requires some light blasting, drilling being done with wagon drills. Front-end loaders then load the broken ore into Diesel trucks for haulage to the 100-ton gravity concentration mill located six miles from the mine. Mine ore averages 23 to 25 percent Cr_2O_3 and is processed in the mill to produce a 44 percent Cr_2O_3 concentrate with a CR/FE ratio of 2.5:1. It is then loaded into railroad cars and shipped to the General Services Administration purchasing depot at Grants Pass, Oregon. Because of the irregular occurrence and softness of the ore, prospecting is very difficult. To date the only proven method has been by wagon drilling. Recently it has been determined that the ore is magnetic and the United Geophysical Company was contracted to conduct a magnetometer survey. A drilling program is now being planned to test these magnetic anomalies to check and evaluate this type of prospecting.

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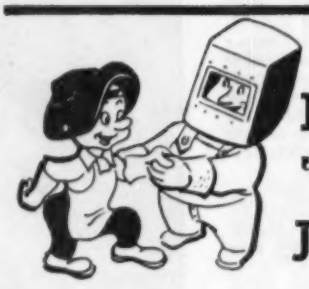

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able sulphur have been blocked out which is considered sufficient for operation of the plant at capacity for three to five years.

The *United States Atomic Energy Commission* is posting information concerning the location of surface areas of high radioactivity at Mojave, California during the period that it is conducting airborne reconnaissance surveys in that area. The locations of radioactivity do not necessarily indicate commercial bodies of uranium.

An underground fire temporarily suspended operations at the *Sixteen-to-One* gold mine at Alleghany, California. Originally located in the timbered ore bin, the fire was brought under control and then spread again to back timbering and other underground workings. Amount or damage has not yet been reported.

The contract for moving *Castle Dome Mining Company's* concentrator to the property of *Copper Cities Mining Company* has been awarded to *National Steel and Construction Company* of Phoenix, Arizona. Both mining companies are subsidiaries of *Miami Copper Company*, Miami, Arizona. The contract covers dismantling and moving the concentrator building to the new site north of Miami, and re-erecting the plant. The work started January 18 and is to be completed within 90 calendar days. Mining and milling operations at Castle Dome ended on December 5, 1953, with the exhaustion of ore reserves. The Copper Cities mine, in the Sleeping Beauty Range, has been under intensive development for the past three years, and present plans call for production to start during the third quarter of 1954.

A lease with option to purchase has been taken on the *Poland* mine by the *Ducor Mining and Milling Corporation* of Monterey Park, California. The Poland property consists of about 200 acres of patented ground located two miles directly east of Walker and eight miles by road west of Humboldt, Arizona. It is owned by James Reed of Prescott, Arizona. The new operators have cleared the Poland Tunnel to the Poland vein, a distance of about 800 feet. In a short drift to the south, they found a winze reported to be 300 feet deep. They have unwatered the winze for 100 feet and have started drifting both directions on the vein at that level. Seven men are employed in the present exploration work under the direction of Louis Dandrea, Mayer, Arizona. H. H. Records is general manager.

Phelps Dodge Corporation's Lavender Pit as Bisbee Arizona should be ready for production about July 1, states Louis S. Cates, chairman of the board. The open-pit operation provides employment for 333 men and strips 60,000 tons of rock daily. Phelps Dodge officials also report that the company's operations in Arizona are now conducted on a basis of 12 days out of 14 instead of the post-Korea schedule of 26 days out of 28. The working force is now scheduled on a basis of 48 hours per workweek.

Eagle Picher Company's Celatom plant at Clark Station, east of Reno, Nevada, announces completion of rehabilitation following a major fire last June. The plant was able to operate during the period of repairs. As a part of the modernization program, crude ore storage has been doubled and an additional Cedar Rapids crusher installed. J. W. Kenney, Jr. is plant manager, replacing T. A. Copeland who resigned last November.

A silver-lead-gold mill is being operated by Gene Gates on the north side of Columbia Marsh near Coaldale Junction, Nevada. The ore is complicated by containing graphite and is mined at the *Argunum Mining Company's* property on the east side of Mount Washington at Candelaria.

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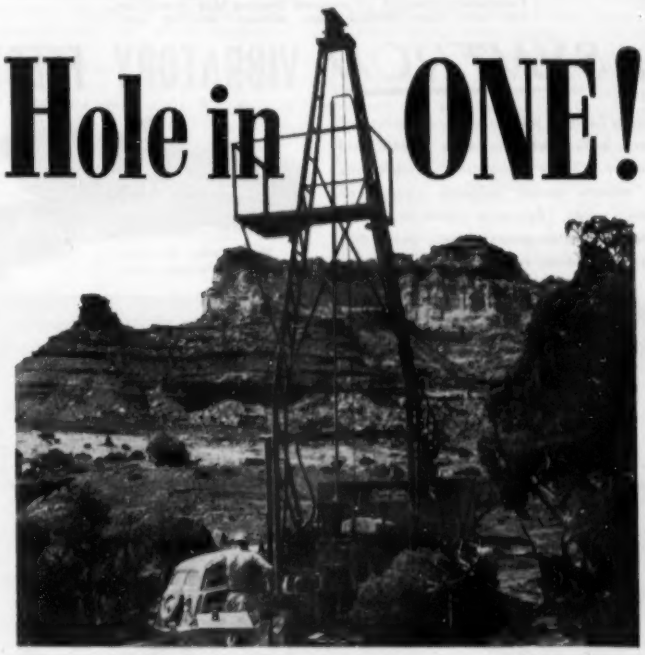

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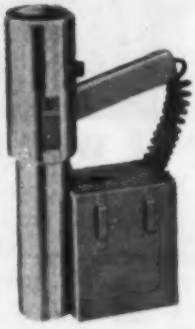

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SOUTHWEST

Julius Toth and J. H. Stoddard are operating the *Lucky* mine east of Cedar Summit and about 14 miles east of Mina, Nevada. The leased copper property is being mined by open pit. The smelter grade copper ore contains silver and some gold.

A 100-ton gravity tungsten mill has been constructed at Toy, Nevada, southwest of Lovelock, by the *Trojan Mining and Milling Company*. The mine is northwest of Toy and is being opened up under a lease agreement by E. M. (Bing) Clark. Values up to 3.0 percent WO_3 have shown. Ed. J. Aherin is the president and general manager of the operation.

Ray Jepperson and Glenn Johnson are reported to have made a potentially rich strike of turquoise at the *Turquoise Queen* mine in Copper Basin, near Battle Mountain, Nevada. Work has been limited to open cutting, with the addition of a compressor and other equipment more intensive development is planned.

The new flotation and grinding mill of *Manganese Inc.* went into operation at Henderson, Nevada on January 22. The plant had been destroyed by fire last July and was completely rebuilt. It features some important changes, designed to increase efficiency of the operation. Two new banks of flotation cells have been added, conditioning facilities have been doubled, and a cyclone installation has been made in the filter building to thicken the concentrates before filtering.

NEW MEXICO

Modern methods of mining low-grade copper ore have now made the site of the town of Santa Rita, New Mexico a valuable metal source for *Kennecott Copper Corporation*. As a result, the town is being shifted 1½ miles northwest to make room for more open-pit mining. Where the company once mined only ore with 2.0 to 3.0 percent copper, it can now profitably use 0.8 to 1.0 percent ore. Cost of the move is being assumed by Kennecott which owns the town site.

Freeport Sulphur Company is reported to have requested permission from the U. S. Bureau of Mines to delay proving up its potash claims east of Carlsbad, New Mexico. The potash market situation is said to be the reason for the company's delay. Although the company's discovery was announced several months ago, production plans have never been revealed.

Duval Sulphur and Potash Company offered the high bid of $27,060 for lease of 440 acres of government land in New Mexico for potash production. The property is about 20 miles northeast of Carlsbad, near the firm's other holdings. Duval has also recently acquired an option to purchase extensive property in Arizona. Diamond drilling is already under way for molybdenum and copper (See MINING WORLD, February 1954, page 95.)

Mining Firms Oppose Plans For Washington Power Dam

Pend Oreille Mines and Metals Company and American Zinc, Lead and Smelting Company, Washington's leading zinc-lead producers, have asked the Federal Power Commission to deny an application of Seattle City Light to build a power dam on the Pend Oreille River at Boundary, Washington. They claim that the dam would flood their riverside operations because of fractures, cavities, and faults in the ore-containing limestone and dolomite rocks.

American Zinc declares that the dam would raise the river level to 1,990 feet, or 65 feet above the present working level in its Grandview lease and 1,030 feet above ore bodies which will be developed ultimately.

Pend Oreille Mines' petition states that about 85 percent of all known ores and potential ores in the Metaline district are located below 1,700 feet elevation.

The Northwest Mining Association and Spokane Chamber of Commerce also have spoken out against the Seattle proposal. Mining interests raised similar objections in 1947 when the Army engineers proposed a dam at Boundary. A hearing on May 29, 1947 in Metaline Falls resulted in a recommendation that no dam be built until the area's mineral reserves are exhausted. (See MINING WORLD, July 1947, page 31.)

Lead-Zinc Firms Reduce Coeur d'Alene Operations

Lead-zinc producers in northern Idaho's Coeur d'Alene mining region have reduced operations from six days to five days weekly to curtail production because of low prices for the base metals. Their output has made Idaho second among states producing lead and zinc.

Among the district's larger operations, only Sunshine Mining Company and Polaris Mining Company, primarily silver producers, continued the 48-hour week adopted in mid-1949.

The district's largest lead-zinc producer, Bunker Hill & Sullivan Mining and Concentrating Company, took the lead in curtailing operations. The Sullivan electrolytic zinc plant shut down one of its four reduction units. Restrictions were placed on custom shipments to the lead smelter and zinc plant and imports of concentrates were curtailed drastically. General Manager J. B. Haffner said the firm's inventory of finished metal was "very large" and inventories of concentrates "out of balance."

About 3,000 men were affected, including 1,800 at Bunker Hill & Sullivan, 500 at operations of American Smelting and Refining Company, 450 at the Star mine operated by Hecla Mining Company, 150 at Day Mines' properties, and 75 employed by Sidney Mining Company.

The six-day work week was retained at ASARCO's Jack Waite lead-zinc operation on the Idaho-Montana border northeast of Wallace because of its isolated location.

New Research Methods May Aid Off-Grade Ores

Off-grade iron, manganese, and chromium ores in the Pacific Northwest may find markets as a result of discoveries made by the U. S. Bureau of Mines' Electrodevelopment Laboratory at Albany, Oregon during 1953.

A practical method of producing pig iron suitable for limited use in jobbing foundries was developed from extensive smelting research on high-phosphorous iron ore from the Scappoose, Oregon area. Preliminary investigations with a selective smelting technique demonstrated the technical feasibility of producing commercially pure iron from the high-phosphorous iron ore.

Standard grade silico-manganese was made from siliceous manganese ores containing more than three times more silica, plus alumina, than the maximum allowed for national stockpiling purposes.

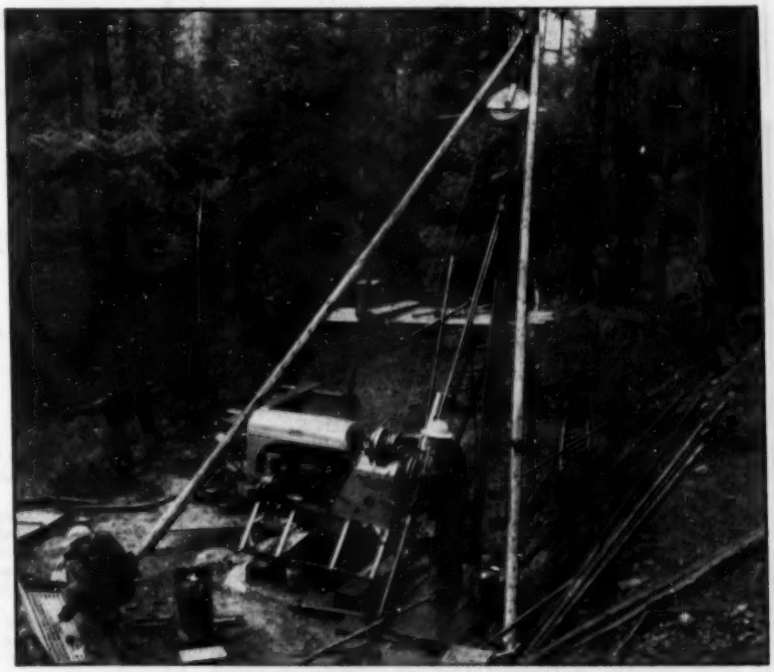
Satisfactory grade high-carbon ferrochrome and ferrochrome silicide were produced from off-grade Montana chromite concentrates in continuous-type smelting tests.

High purity chromium-iron alloys having superior physical properties were produced. Containing more than 60 percent chromium and less than 0.005 percent oxygen, they have high-temperature possibilities.

A process was developed to separate columbium and tantalum by a liquid-liquid extraction technique based upon selective hydrolysis of the anhydrous chlorides.

Calera Mining Company, subsidiary of *Howe Sound Company*, has been granted a $285,138 DMEA loan for a $407,340 search for cobalt-copper ore bodies near its *Blackbird* mine in Lemhi County, Idaho. Both surface and underground work are planned, with the contract running for two years. At the mine itself the company is doubling its crew to about 270 men. Operations were curtailed early last year because of production problems at its new Garfield, Utah cobalt refinery. Since the layoffs, about 75 two- and three-bedroom apartments have been constructed at the mine camp.

New Park Mining Company of Salt Lake City, Utah has assumed active management of the *Vindicator* exploration project, east of Mullan, Shoshone County, Idaho. The Vindicator is being operated through an agreement with the *Silver Buckle Mining Company* of Wallace, Idaho. Officers of Silver Buckle are: Dr. F. E. Scott of Wallace, president; Clark L. Wilson, vice president of New Park, vice president and manager of operations of Silver Buckle; Jack D. Gay of Wallace,



Grandview Explores for Lead and Zinc

Grandview Mines of Spokane, Washington has not let the low prices of lead and zinc discourage it from exploring for base metal deposits. The firm is conducting $57,400 worth of diamond drilling in northern Stevens County, Washington under two lead-zinc projects recently approved by the DMEA. (The applications were filed before the agency's deadline of May 15, 1953.) Two crews are working the Dosser-Maki-Lotz prospects in the Currant Creek area, and a third crew is at the Hartbauer prospect near Deep Lake. The latter adjoins the Anderson open-pit zinc mine of Goldfield Consolidated Mines Company of Reno, Nevada and is considered to be the best showing. The photograph above shows diamond drillers J. C. Purcell of Colville (by machine) and B. A. Dailey of Deep Lake (on platform) at work on the Dosser-Maki-Lotz claims. At the left, Karl W. Jasper, company president, is inspecting the latest cores taken at a depth of more than 300 feet.

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treasurer; and Alden Hull of Wallace, secretary. The operations of Silver Buckle are being directed by Mr. Wilson; Gale A. Hansen of New Park has been appointed superintendent and is living at the mine. The necessary equipment for the operation has been purchased and actual work has been started. The first 540 feet of the Vindicator tunnel have been rehabilitated and an additional 110 feet are being widened to provide adequate haulage facilities. A shaft station will be cut on this level underground and an 800-foot shaft sunk to establish a new level at 750 feet. The project is a DMEA participation and calls for 1,700 feet of drift and crosscut to prospect the Vindicator vein on the 750-foot level.

Austin-Meyer Corporation is preparing to resume open-pit mining at the old *Weber* mine near Lakeview, Bonner County, Idaho. Production between June and November 1953 totaled 10,730 tons of ore having a gross smelter value of $75,634. Gross value of output since 1949 has been $344,830, despite the fact early-day miners removed much of the high-grade by shallow underground workings. Robert B. Austin of Wallace heads the corporation.

Sullivan Zinc Company's new sulphuric acid plant, adjoining its electrolytic zinc plant near Kellogg, Shoshone County, Idaho is scheduled to go into production in April. *General Chemical Division* of *Allied Chemical and Dye Corporation* has been named sales agent. W. G. Woolf is plant manager.

Good grade silver-copper ore has been opened for more than 250 feet in a 3100 level west drift along the Yankee Girl No. 2 vein in the property of *Sunshine Consolidated Mines, Inc.*, on Big Creek, Shoshone County, Idaho. Development ore from the drift and a raise averaged about 45 ounces of silver to the ton. A raise has been driven to the 2700 level to improve ventilation and facilitate westerly development work. The 2700 level drift westerly on the main Yankee Girl vein has been advanced to within a few hundred feet of the projected upward extension of the most westerly stope on the 3100 level. Norman M. Smith is directing engineer.

E. J. Jacobsen and Michael Ban of Mullan, Shoshone County, Idaho have been given a contract for shaft sinking and other work under a $229,500 DMEA-approved project at the *Vindicator Silver-Lead* property east of Mullan. *Silver Buckle Mining Company* of Wallace has an operating agreement with the Vindicator firm.

The main ore body at the *Lucky Friday Silver-Lead Mines* property east of Mullan, Idaho has been opened for about 400 feet on the new 2300-foot level, with both faces still in good milling grade ore. Production is averaging about 125 tons daily. A recent 5,000-ton mill-run averaged 17.6 ounces silver, 9.16 percent lead and 1.4 percent zinc per ton. Dave Elder is mine superintendent.

Swansea Mines, Inc. plans to sink a winze on silver-copper ore found recently at its *Silver Bell* property in Lewis and Clark County, Idaho. Three hundred feet of drifting on the main Silver Bell vein indicated the draft was at the top of an ore body. It is hoped that the winze will disclose enough direct-shipping ore to finance installation of a mill. C. L. Hewitt of Helena is president.

Thirteen lessees are mining and milling lead-zinc ore from the 300, 400, 500, 700 and 1,300 levels of the *Highland-Surprise Consolidated Mining Company* property on Pine Creek in the Coeur d'Alenes, Idaho. The company is carrying out a $284,000 DMEA contract on lower levels. Some high-grade lead-zinc has been found on the new 1,650 level. Frank J. Luedke of Spokane is company president.

The Idaho State Land Board has approved mineral leases for Edith Justis and Ada Bushnell of Boise, covering 40 acres in Blaine County, for quartz; and Ira R. Moon, Gale Moon, and Ben Williams of Malad, covering 40 acres in Oneida County, for quartz.

The DMEA has approved an extension of time for Elmer Enderlin to complete the 500 feet of drift work on the No. 2 vein at his *Meadow View* claim in Custer County, Idaho. The total contract calls for an expenditure of $27,120. The No. 1 and 2 veins have been cross cut, and the ore is considered to be good milling grade zinc and tungsten with some values in copper and silver. The ore in the No. 2 vein has shown considerable improvement at approximately 200 feet in depth. Completion of the project is expected in October 1954.

A hammermill has been installed at the Rock Creek gypsum mine southwest of Weiser, Washington County, Idaho. The property, owned by *Northwest Gypsum Company*, is being operated by Melvin Taylor. Arthur Stueckle of Colfax, Washington is secretary of the firm.

A new magnetic separator for monazite sands has been installed by the *Idaho Titanium Company* at Weiser, Idaho. The sands treated come from the Ruby Meadows area of the Snake River Basin, and run from 6 to 25 percent monazite. Also recovered are garnet, zircon, ilmenite, fine gold, quartz, and magnetite.

Nearly 25,000 feet of exploration hole was drilled from surface at the *Gay* phosphate mine of *J. R. Simplot Company* near Fort Hall, Idaho, before the winter season curtailed operations. Some drilling was also done at Arbon Valley about 35 miles southwest of Pocatello where the exploration was for barite, and at Randolph, Utah for phosphate.

MONTANA

Anaconda Copper Mining Company is reducing its work week at its Montana properties from six to five days a week. This will, in effect, cut copper production from the mines in Butte by about 10 percent or 700 tons of refined copper per month, and reduce refined zinc from the smelters and refineries at Anaconda and Great Falls by between 10 and 15 per cent or about 2,000 tons a month. Operations at the *Badger* and *Belmont* mines will be suspended and the employees transferred to other Anaconda operations. The mines and mills will continue to operate on a six-day schedule, but the men will work only a five-day shift.

The deep snow and cold weather has hampered small prospectors and operators in western Montana. Little activity is expected in the district before the spring thaws.

The General Services Administration's depot at Philipsburg, Montana is now reported to be interested in black dioxide manganese samples running as low as 15 percent. Until now, only 18 percent and higher manganese had been acceptable. The new program should help to develop lower grade ore.

To date some 30,000 cubic yards of concrete out of a required 70,000 cubic yards have been poured at the *Anaconda Aluminum Company's* reduction plant now under construction at Columbia Falls, Montana, and steel work is about 20 percent completed. Excavation for the

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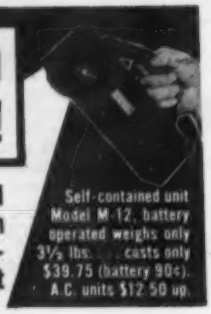

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alumina unloading station has started, and construction of housing facilities is continuing. Completion of the entire project is scheduled for 1955.

Alva R. Sharp reports that he has intersected a vein in the low crosscut and haulage tunnel of his property near Mazama, Okanogan County, Washington. Mr. Sharp is also part owner of the *Gold Coin* property consisting of 10 claims about one-half mile from Mazama where work on a crosscut and haulage tunnel has also started. Robert Crandall is engineer for the projects.

Pend Oreille Mines and Metals Company is producing between 1,500 and 1,600 tons of zinc-lead ore daily in the Metaline district, Pend Oreille County, Washington, despite reduction of the work week from six days to five in the last quarter of 1953. Production was boosted 40 percent in 1953 to surpass the half-million ton mark for the first time. Output reached 500,042 tons in 1953, compared with 356,205 tons in 1952 and 273,580 tons in 1951. All 1953 production was from the firm's new concentrator. The old mill was kept idle because of low metal prices. Its operation would have brought 1953 production to more than 750,000 tons. Increased tonnage and additional trackless mining equipment materially reduced per-ton costs. Jens Jensen of Spokane is vice president and treasurer.

Spokane interests have organized *Lands, Inc.* to acquire and develop mining, timber, and industrial properties. Capitalization is $300,000 and number of stockholders limited to 15. Kenneth H. Klopp is president; R. Maurice Cooper, secretary-treasurer, and William D. Weaver, general manager. Plans include several thousand feet of diamond drilling and tunneling at the old *United Treasure* lead-silver mine in northeastern Stevens County, Washington, and testing of the *Viking* gold property near Libby, Montana. Mr. Weaver did some work at both properties in 1953. Uranium exploration in southwestern Utah is under consideration.

The Washington land office of the Bureau of Land Management in Spokane has canceled two gold and silver mining claims and a millsite claim entered in the Swauk mining district near Ellensburg, Washington by Mrs. Anna K. Vernon. The land office said evidence in a hearing instituted by the U. S. Forest Service indicated that minerals had not been found in sufficient quantity to constitute a valid discovery.

The *Little King* tungsten exploration project near Deer Park, southern Stevens County, Washington, is being pushed on a two-shift basis by *Sunshine Mining Company*, big northern Idaho silver producer. An adit has been driven several hundred feet into the south side of Blue Grouse Mountain at 3,700 feet elevation. A gasoline-powered air compressor is in use. A large combination cookhouse and miners' change house and a 100-foot portal snowshed were completed just ahead of winter snows. Rowland King, Sunshine's exploration engineer in Spokane, is in charge.

Howe Sound Company is undertaking a $219,410 copper exploration project at Buckskin Mountain, Chelan County, Washington. A 4,000-foot cross cut will be driven from workings of its *Holden* mine, Washington's largest copper producer. The DMEA will loan the firm half the cost.

Gerco Company has been capitalized at $50,000 by Leslie F. Williams, Jack D. Sandberg and G. A. Pershall, Spokane business men, to distribute a gold panning machine invented by Peter L. Gregersen of Spokane, Washington. The inventor claims virtual 100 percent recoveries from placer material with the portable gold separator. He demonstrated a model in Alaska last year, and a larger machine is now being tested near Las Vegas. Mr. Williams is president of the new firm.

Sunny Peak Mining Company of Spokane, Washington has purchased assets of *Ambassador Mines Corporation*, Spokane, for 400,340 shares of stock. Ambassador stockholders will receive two shares of the nonassessable, 20-cent par stock for each share of Ambassador stock held, in return for mine machinery and equipment at a 21-claim property leased from Sunny Peak in Sanders County, Montana, and the adjoining *Black Bear* and *Brown Bear* claims. Ambassador shareholders agreed to purchase 150,000 shares of Sunny Peak stock at 20 cents each. It is planned to use the funds and machinery in development of Sunny Peak's *Gubser* silver claims near Conconully, Okanogan County, Washington. F. W. Kiesling is secretary-treasurer.

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1—7 ton Atlas battery, 36" gauge
3—8 ton Ironton battery, 36" gauge
2—8 ton General Electric battery, 36" gauge
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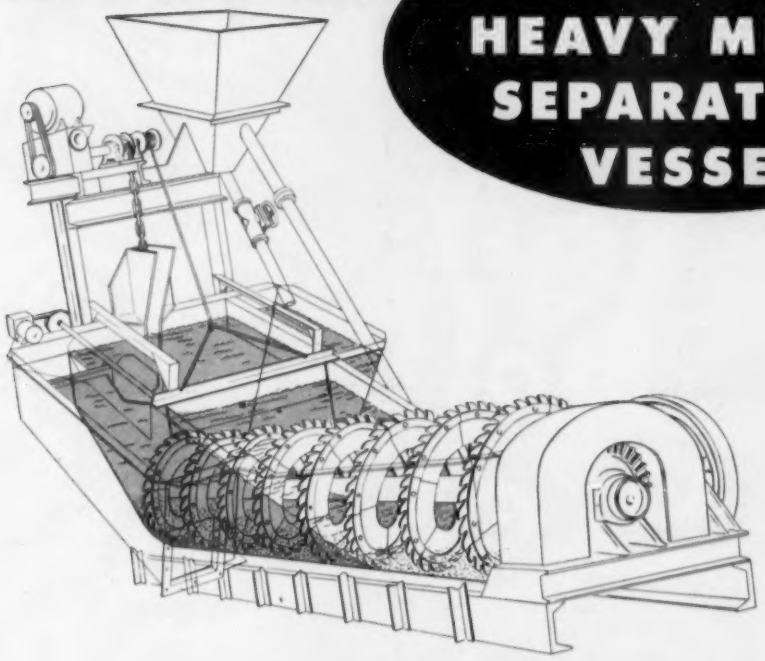

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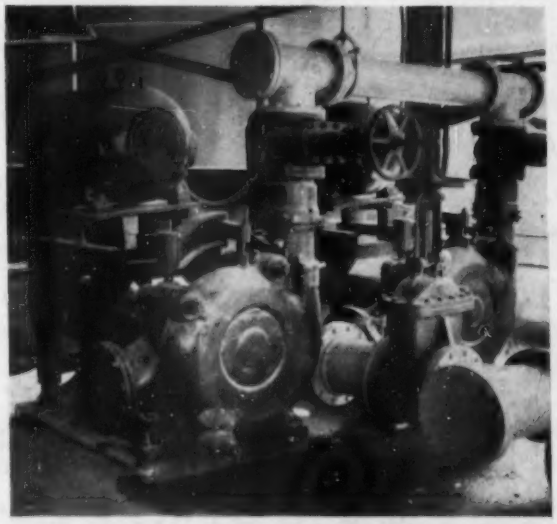

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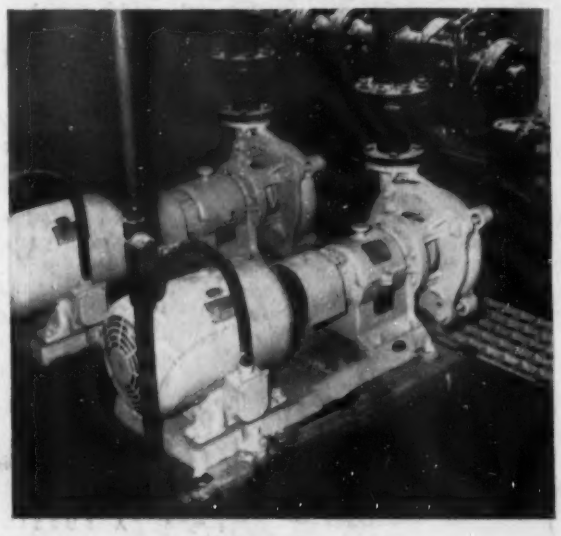

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